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SELECTED WATER RESOURCES ABSTRACTS

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VOLUME 10, NUMBER 18
SEPTEMBER 15, 1977

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CODEN: SWRABW

U.S. DEPARTMENT OF THE INTERIOR
OFFICE OF WATER RESEARCH AND TECHNOLOGY

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

VOLUME 10, NUMBER 18
SEPTEMBER 15, 1977

W77-08601 – W77-09100

The Secretary of the U.S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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EFFECTS OF SPATIAL VARIABILITY OF SOIL HYDRAULIC PROPERTIES IN WATER BUDGET MODELING,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
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Systems Control, Inc., Palo Alto, Calif.
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Utah Water Research Lab., Logan.
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PRINCIPLES OF GRAPHICAL GRADUALLY VARIED FLOW MODEL,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-09015

2B. Precipitation

POINT STOCHASTIC ANALYSIS OF DAILY RAINFALL OCCURRENCE WITH APPLICATION TO INDIANA,
Purdue University, West Lafayette, Indiana.
M. L. Kavvas.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 006, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, May 1975. 190 p, 14 tab, 6 ref, 3 append. OWRT B-036-IND(6).

Descriptors: *Rainfall, *Stochastic processes, *Indiana, *Statistical models, Statistical tests, Probability, *Model studies.
Identifiers: *Rainfall occurrences, *Cyclicity, Stochastic analysis, Stochastic models, Poisson method.

The point stochastic analysis of daily rainfall occurrences in Indiana is discussed. The point statistical analysis was performed utilizing some statistical functions and some statistical tests of hypotheses. First, the analysis of trends in the daily rainfall counting process was performed. There are cyclicities both in the first and the second moments of the point stochastic process. Physicaly meaningful annual and 15-day cycles were significant. There is also a slight downward trend in the rate of daily rainfall occurrence in Indiana. The data were homogenized under the independent counting increments assumption and the Poisson model was tested by formal statistical tests and by statistical functions. The model was rejected for the daily rainfall counting process in Indiana. From the behavior of the spectrum and the variance-time function of the daily rainfall counts a clustering of the daily rainfalls in terms of storms is apparent. The Neyman-Scott cluster process was constructed in the time dimension to model this physical dependence. Physical concepts were attached to various components of the model. The model fits the data quite well. Due to its very flexible spectral structure and to its physical interpretation of the various components of the rainfall occurrence, Neyman-Scott cluster model deserves further investigation in different climates of the world.
W77-08935

2C. Snow, Ice, and Frost

SNOWMELT: A TWO-DIMENSIONAL TURBULENT DIFFUSION MODEL,
Canterbury Univ., Christchurch (New Zealand).
R. N. Weisman.
Water Resources Research, Vol. 13, No. 2, p 337-342, April 1977. 7 fig, 2 tab, 18 ref.

Descriptors: *Snowmelt, *Heat transfer, *Diffusion, *Turbulent flow, *Model studies, Mathematical models, Winds, Heat, Latent heat, Melting, Snowpacks, Water vapor, Humidity, Temperature, Turbulence, Melt water.
Identifiers: *Turbulent diffusion models.

The melt from a ripe snowpack due to sensible and latent heat flux was considered. The problem is two-dimensional; the snow field has a well-defined leading edge. The equations that describe the airflow over the snow are the conservation of momentum, sensible heat, and water vapor. The turbulent diffusion is formulated by semi-empirical turbulence theory. The solution showed the manner in which the point melt varies downwind from the landing edge, and the average melt varies with the fetch of the snowpack for varying degrees of atmospheric stability conditions. The results indicated that a reasonably accurate estimate of total melt can be achieved by using the one-dimensional formulae with temperature, humidity, and velocity measurements taken over the central part of the snow field. (Sims-ISWS)
W77-08823

WATER AND ICE POTENTIALS IN FROZEN SOILS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
P. H. Groenevelt, and B. D. Kay.
Water Resources Research, Vol. 13, No. 2, p 445-449, April 1977. 3 fig, 19 ref.

Descriptors: *Frozen soils, *Moisture content, *Ice, *Model studies, Mathematical models, Porous media, Soils, Soil water, Voids, Hysteresis, Temperature, Freezing, Frozen ground, Frost, Frost action.

The envelope pressure potentials of the liquid water and ice in a frozen soil were defined. The envelope pressure potential of liquid water is a generalization of the definition of the envelope pressure potential (overburden potential) of the water in an unfrozen swelling soil. In order to express the envelope pressure potentials in terms of volume ratios, use was made of the void ratio, the moisture ratio equivalent, and the ice ratio equivalent. A new development was initiated by the formulation and derivation of the frost potential of both the liquid water and the ice. These frost potentials were expressed in terms of the ice ratio, the moisture ratio, the ice ratio equivalent, and the moisture ratio equivalent. The relations between these variables are intrinsic properties of the porous medium which have to be determined experimentally. (Sims-ISWS)
W77-08828

WAS THERE A LATE-WURM ARCTIC ICE SHEET,
Maine Univ. at Orono. Dept. of Geological; and Maine Univ. at Orono. Inst. for Quaternary Studies.
T. Hughes, G. H. Denton, and M. G. Grosswald.
Nature, Vol 266, No 5603, p 596-602, April 14, 1977. 4 fig, 1 tab, 46 ref.

Descriptors: *Glaciers, *Ice, *Arctic, *Antarctic, Geomorphology, Glaciation, Icebergs, Movement, Water levels, Glaciology.
Identifiers: *Ice sheets, Ice domes, Ice shelves, Ice streams, Calving bays.

A simplification and synthesis of late-Wurm Northern Hemisphere glaciation is possible by postulating an Arctic Ice Sheet that behaved as a single dynamic system. (Sims-ISWS)
W77-08839

STUDY OF AN ICE CORE TO THE BEDROCK IN THE ACCUMULATION ZONE OF AN ALPINE GLACIER,
Centre National de la Recherche Scientifique, Grenoble (France). Laboratoire de Glaciologie.
M. Vallon, J-R. Petit, and B. Fabre.
Journal of Glaciology, Vol 17, No 75, p 13-28, 1976. 12 fig, 30 ref, append.

Descriptors: *Glaciers, *Ice, *Stratigraphy, *Cores, Glaciology, Firn, Crystals, Cryology, Density, Ablation, On-site investigations, Physical properties, Optical properties, Cold regions, Permeability, Analysis.
Identifiers: *Alpine glaciers, Temperate glaciers, Foliation.

A water table appearing every summer where the ice begins, at a depth of approximately 30 m, ac-

celerates the transformation of firn into ice during the summer (80% of the ice formed every year appears in less than 2 months). The ice formed in the mentioned way contains from 0 to 0.6% water. The average water content increases gradually with the depth because of the heat of deformation. But, near bedrock, between 180 and 187 m, the permeability of the blue ice is such that the water content drops (0.3% as compared to 1.3% between 160 and 180 m). From a depth of 33 m, a foliation of sedimentary origin gradually develops in the ice. Foliation dip increases regularly to a depth of 145 m. At 145 m, foliation jumps suddenly from 20 deg to 40 deg, then at 170 m from 40 deg to 65 deg, which can be explained by old modification in the bergschrund. The foliation disappears near bedrock (180-187 m), where there are no bubbles in the ice. The average size of an ice crystal increases slowly in the firn, shows seasonal fluctuations between 30 and 50 m, then jumps from a diameter of 1 or 2 mm to 10 or 20 mm between 50 and 80 m. Between 180 and 187 m, the ice is made of large crystals (3-10 cm diamter; the figure, however, probably is inexact due to a recrystallization of the samples). The very strong sub-vertical orientation of the optic axes of the firn crystals disappears quickly, and from 66 m on, in ice with large crystals, a fabric of multiple maxima appears (generally, 3 or 4 directions, forming a triangle or a rhombus). On the other hand, in the small crystals that form bands parallel to the plane of foliation, only one direction of preferential orientation can be seen, or two close to one another. Crystals of intermediate size (10 to 50 mm) generally have two directions of preferred orientation at an angle of approximately 50 deg to one another. No matter how big the crystals are, the angle between the most common c-axis orientation and the vertical does not change from 60 to 170 m depth. (Humphreys-ISWS)
W77-08846

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-08915

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W77-08933

THE MAXIMUM EXTENT OF GLACIERS IN PART OF WEST FALKLAND,
Aberdeen Univ. (Scotland). Dept. of Geography.
C. M. Clapperton, and D. E. Sugden.
Journal of Glaciology, Vol. 17, No. 75, p 73-77, 1976. 4 fig, 7 ref.

Descriptors: *Glaciation, *Geomorphology, *On-site investigations, *Glaciers, Cirques, Exploration, Evaluation, Glacial drift, Till, Topography, Pleistocene epoach.
Identifiers: *Falkland Islands.

Although it is known that cirque glaciers once existed in the Falkland Islands, it has remained in doubt whether or not the islands were ever covered by ice caps or an ice sheet during the Cainozoic. This paper scrutinized geomorphological evidence on the southeastern flank of a high massif in West Falkland. It was suggested that, at the time of their maximum extent in the Cainozoic, the largest glaciers were no more than 2.7 km long. Unless the raised beaches are later shown to be related to glacio-isostatic movements within the Falkland Islands, it is reasonable to conclude that, at the time of the maximum extent of glaciers in West Falkland, ice did not extend beyond the cirques and the upper reaches of associated valleys. (Humphreys-ISWS)
W77-09032

AN EXPERIMENTAL STUDY OF THE MOTION OF ICE PAST OBSTACLES BY THE PROCESS OF REGELATION,
Bristol Univ. (England). H. H. Willis Physics Lab.
E. M. Morris.
Journal of Glaciology, Vol. 17, No. 75, p 79-98, 1976. 10 fig, 1 tab, 17 ref.

Descriptors: *Glaciers, *Ice, *Movement, *Laboratory tests, Glaciology, Freezing, Melting, Velocity, Theoretical analysis, Laboratory equipment, Viscometers, Temperature.
Identifiers: *Basal sliding, *Regelation, Temperate glaciers.

The results of regelation experiments, in which a single object is pulled through ice, cannot be applied directly to the problem of basal sliding in glaciers becasuse the two systems have different geometries. When the force applied to a single object is small, impurities trapped in the regelation water layer around the object inhibit the regelation process. At larger forces, above the Drake-Shreve transition point, impurities are shed in a trace behind the object. However, when ice moves over a series of obstacles, a trace may exist above and below the transition point. The regelation velocity below the transition point is not reduced by the effect of trapped impurities. In an experiment in which brass cylinders of various cross-sections rotate in ice, the ratio between the expected regelation velocity, calculated using the basal-sliding theory of Nye, and the measured regelation velocity is 8+ or - 2, both above and below the transition point. The same ratio has been obtained by other workers with wires of similar thermal conductivity above the transition point. Measurements of temperature differences indicate that supercooling cannot be the main source of the unexpectedly low regelation velocities above the transition point. (Humphreys-ISWS)
W77-09033

2D. Evaporation and Transpiration

ASPECTS OF THE DAILY AND SEASONAL COURSE OF TRANSPIRATION INTENSITY IN MEADOW PLANTS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
L. N. Alekseenko.
Bot Zh (Leningr) 60(12); p 1740-1749, 1975.

Descriptors: *Transpiration, *Variability, *Fluctuations, Vegetation, Cycles, Water supply, Plant physiology, Biorhythms.
Identifiers: *Meadow plants, *Transpiration intensity, USSR.

During a plentiful water supply, daily changes in transpiration intensity (TI) corresponded, in 30 meadow species, to environmental changes. TI increased from morning to noon, reached a maximum in the early afternon and decreased toward evening. Highest TI was often observed in midmorning and sometimes in the late afternoon. TI curve may have 2 peaks with a midday depression or more than 2 peaks. The changes in TI during an adequate water supply indicated that transpiration rates were determined by plant physiology and not by environment during some hours of the day. A similar conclusion was reached in reference to TI variations during the vegetative period. In the majority of species, the seasonal course of TI was asymetric, reaching a maximum at the beginning of heading and budding with a gradual decrease until fruit and seed ripening.
W77-08709

TRANSPIRATION INTENSITY OF MEADOW PLANTS, (IN RUSSIAN),
Leningrad State Univ. (USSR).
L. N. Alekseenko.
Bot Zh (Leningr) 60(10), p 1456-1466, 1975.

Descriptors: *Transpiration, Vegetation, Water utilization, Consumptive use.
Identifiers: Hygrophytes, Meadow plants, Eumesophyte, Intensity, Hygromesophytes.

The transpiration intensities (TI) of 41 spp. of primarily meadow plants are given. A small group of species with an average TI of < 0.60 g.h/g fresh weight was distinguished. The majority of meadow plants have an average TI from 0.60-0.90 and 7 spp. from 0.90-1.47 g.h/g fresh weight. The majority of the plants species consume about 95-110% of the water supply in the leaves per hour, and during daylight it is renewed 20-22 times. There are no statistically significant differences with respect to the average TI between eumesophytes, hygromesophytes and hygrophytes. No correlation was found between TI and size and shape of the leaf blade.
W77-08714

EVAPORATION FROM SEVEN RESERVOIRS IN THE DENVER WATER-SUPPLY SYSTEM, CENTRAL COLORADO,
Geological Survey, Reston, Va. Water Resource Div.; and Geological Survey, Lakewood, Colo.
J. F. Ficke, D. B. Adams, and T. W. Danielson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 323, Price codes: A09 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-114, April 1977. 170 p, 48 fig, 15 tab, 15 ref.

Descriptors: *Evaporation, *Reservoirs, *Colorado, Data collections, Analytical techniques, Energy budget, Mass transfer, Evaporation pans, Evaluation, Water supply.
Identifiers: Central Colorado.

Seven reservoirs in central Colorado, operated by the Denver Board of Water Commissioners, were studied during 1967-73 to determine evaporation losses. These reservoirs, Elevenmile Canyon, Dillon, Gross, Antero, Cheesman, Williams Fork, and Ralston, are located on both sides of the Continental Divide. Methods for computing evaporation include energy-budget, mass-transfer, and pan relationships. Three reservoirs, Elevenmile Canyon, Dillon, and Gross, had mass-transfer coefficients calibrated by energy-budget studies. At the remaining reservoirs, an empirical technique was used to estimate the mass-transfer coefficient. The enery-budget-calibrated methods give the most accurate evaporation values; the empirical coefficients give only a best estimate of evaporation. All reservoirs should be calibrated by energy-budget studies. The pan method of computing evaporation is the least reliable method because of problems of advected energy through the sides of the pan, representative pan exposure, and the irregularity of ratios of reservoir to pan evaporation. (Woodard-USGS)
W77-08736

2E. Streamflow and Runoff

FLOODS IN THE BIG CREEK BASIN, LINN COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
A. J. Heinitz.
Open-file report 77-209, January 1977. 35 p, 8 fig, 5 tab, 4 ref.

Descriptors: *Floods, *Flood data, *Flood profiles, *Flood recurrence interval, *Streamflow, Flow rates, Peak discharge, State-discharge relations, Flood frequency.
Identifiers: *Linn County(Iowa), *Big Creek basin.

Flood information for the Big Creek basin in Linn County, Iowa, should be of use to those concerned with the design of bridges and other structures on the flood plains of the streams. Water-surface profiles for the flood of May 1974 are given for Big Creek and its major tributaries, East Big, Crabap-

ple, Elbow, and Abbe Creeks. The May 1974 flood was at least a 50-year flood on East Big Creek and along certain reaches of Big and Abbe Creeks. Also included for Big Creek are a profile of the December 1971 medium-stage flow and a partial profile for the minor flood of July 1971. Profiles for the low-water condition of October 26, 1972, are shown for all reaches. Water-surface profiles for the 25- and 50-year floods are estimated in relation to the May 1974 flood. (Woodard-USGS)
W77-08731

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS LOW-FLOW FREQUENCY AND FLOW DURATION,
Geological Survey, Rolla, Mo. Water Resources Div.
J. Skelton.
Missouri Department of Natural Resources, Geological Survey, Rolla, Water Resources Report No 32, 1976. 71 p, 24 fig, 1 plate, 5 tab, 13 ref.

Descriptors: *Low flow, *Statistical methods, *Low-flow frequency, *Flow duration, *Missouri, Hydrologic data, Streamflow, Flow rates, Regulated flow, Seepage, Droughts.

A statistical analysis of low-flow information for Missouri streams contains low-flow frequency data for 460 continuous- and partial-record gaging stations, discharge measurements and approximate frequency data for 66 partial-record stations, and flow-duration data for 84 long-time continuous-record stations. Maps showing seepage-run data collected in Ozarks basins are included to supplement tabulated frequency information from the gaging stations and to permit extrapolation of these frequency data to many additional sites. Low-flow characteristics of streams vary among physiographic regions in Missouri. The low-flow potential of most Plains streams is poor because of the low hydraulic conductivity of the clays and shales in the area. Storage reservoirs are required for effective utilization of surface-water supplies in this region. Ozark streams generally have the best sustained low flows in the state because of groundwater inflow from extensive natural reservoirs in the soluble carbonate rocks, but this pattern is not consistent in the region. The solution cavities result in water losses and nonconformance to areal patterns in some basins. Low flows in the Southeastern Lowlands are second in magnitude to those of the Ozarks because of groundwater inflow from the extensive alluvial aquifer. (Woodard-USGS)
W77-08743

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
C. Lai.
In: International Symposium on Unsteady Flow in Open Channels, held at University of Newcastle-upon-Tyne, England, April 12-15, 1976: BHRA Fluid Engineering, Cranfield, Bedford, England, p D1-1 - D1-12, 1976. 5 fig, 1 tab, 12 ref.

Descriptors: *Model studies, *Open channel flow, *Unsteady flow, *Numerical analysis, *Computer models, Mathematical models, Analytical techniques, Input-output analysis, Evaluation, Correlation analysis.
Identifiers: *Method of characteristics, One-dimensional flow, Two dimensional flow, Specified-time-interval scheme.

The method of characteristics is well suited to the simulation of one-dimensional, unsteady, open-channel flow. When a numerical scheme based upon specified time intervals is employed, one can solve the characteristics equations to second-order accuracy by the trapezoidal rule using iteration, or by applying an extrapolation procedure to two sets of linear computations using two different sizes of time interval. Numerical experiments showed virtually the same results for the two techniques. The second technique, however, is preferred for it generally consumes less computer time, and offers the option of selecting first- or second-order results. In attempting to extend the method of characteristics to two-dimensional flow in a wide river, or embayment, one finds a number of dissimilarities as well as similarities between the two cases. Many favorable features of the method of characteristics for one-dimensional flow are lost in the two-dimensional case, thus complicating the flow computation. Again, if the specified-time-interval scheme is used, second-order results may be obtained by the trapezoidal rule with iteration, or by the extrapolation procedure applied to two linear systems. However, the iteration technique in the two-dimensional flow is extremely cumbersome and solution - despite many favorable results - is not always successful. The latter offers an advantage of requiring no iteration, but it requires more memory. (Woodard-USGS)
W77-08745

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08755

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08830

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT ON RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08831

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
For primary bibliographic entry see Field 4A.
W77-08834

EFFECT OF AGRICULTURAL AND SILVICULTURAL PRACTICES ON THE RUNOFF FROM DRAINAGE BASINS OF THE NIZHNEDEVITSKAYA HYDROLOGIC STATION,
For primary bibliographic entry see Field 4C.
W77-08835

PERFORMANCE CHARACTERISTICS OF A GRASSED-WATERWAY TRANSITION,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
For primary bibliographic entry see Field 4D.
W77-08849

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-08920

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W77-08932

COUPLED DYNAMIC STREAMFLOW-TEMPERATURE MODELS,
Utah Water Research Lab., Logan.
D. S. Bowles, D. L. Fread, and W. J. Grenney.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12929, p 515-530, May 1977. 7 fig, 2 tab, 13 ref, 1 append.

Descriptors: *Computer models, *Forecasting, *Texas, Model studies, Heat balance, Hydraulics, Rivers, Mathematical models, Streamflow forecasting, Systems analysis, Temperature, *Water temperature.
Identifiers: *Systems engineering, *Dynamic streamflow, *Brazos-Little River System(Texas), Stream-water quality, Dynamic stream temperature model, Heat exchange, Parameters.

Interest in stream temperature prediction stems largely from concern for the possible deleterious environmental consequences of thermally polluted surface waters. Stream temperature is an important determinant of the solubility fo dissolved gases, biological reaction kinetics, the distribution of fish and lower forms of aquatic life, and the efficiency of water treatment for domestic and industrial use. Th epaper described the Hynamic Stream Temperature Model (DSTEMP). The model is suitable for prediction of stream temperatures over a diurnal cycle and over extended periods of time. The DSTEMP model can be used for unsteady flow conditions by linkage with a dynamic streamflow routing model (DNRT). Alternatively, steady flow conditions may be specified. Data requirements are realistic in terms of data types usually collected by the National Weather Service, NOAA, and the United States Geological Survey. In addition to describing the model, an application of DNRT-DSTEMP to the Brazos-Little Rivers, Texas, was included to illustrate that the models provide a practical tool for streamflow-stream temperature forecasting. (Roberts-ISWS)
W77-09014

PRINCIPLES OF GRAPHICAL GRADUALLY VARIED FLOW MODEL,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
N. Kouwen, R. A. Harrington, and S. I. Solomon.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12939, p 531-541, May 1977. 7 fig, 5 ref, 2 append.

Descriptors: *Backwater, *Model studies, *Flow, Computers, Gradually varied flow, *Graphical analysis, Graphical methods, Hydraulics, Open channel flow, Flow profiles, Equations, Rivers.
Identifiers: *Backwater models, *Hydraulic transform graphs, Water surface profiles.

Any gradually varied flow computation requires the solution of the energy and continuity equations. To this end, many techniques are available. For prismatic channels, the Direct Step Method gives a result without requiring iteration. However, for nonprismatic channels, it is necessary to resort to some variation of, the Standard Step Method, thereby requiring some iterative procedure. A graphical solution, using a simple program to construct a set of curves, can eliminate iteration as well as retain flexibility with regard to flow variations along the reach. To accomplish this, a graphical solution of the energy equation was presented which uses hydraulic transform graphs for river cross sections along a reach. (Lee-ISWS)
W77-09015

DRAG AND INERTIA FORCES ON A CYLINDER IN PERIODIC FLOW,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 8B.
W77-09017

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 2K.
W77-09027

MULTIVARIATE DISTRIBUTIONS IN HYDROLOGY AND RIVER REGULATION,
N. A. Kartvelishvili, and L. T. Gottschalk.
Nordic Hydrology, Vol. 7, No. 5, p 265-280, 1976. 5 fig, 2 tab, 7 ref.

Descriptors: *Runoff, *Rivers, *Model studies, Mathematical models, *Regulated flow, *River regulation, Markov processes, Finite element analysis, Hydrology, *Distribution patterns.
Identifiers: *Multivariate distributions.

It is assumed that the river runoff process can be approximated by a Markov process. The process is described by M distribution functions. Fundamental hypothesis of relations between multivariate distributions and corresponding maginal distributions was given. A finite difference scheme for multisite and multilag generation of river runoff was derived. The derivation is based on the multivariate normal distribution. Different methods of determination of the order of the finite difference scheme were discussed as well as the influence of model order and method of parameter estimation on properties of the model. (Sims-ISWS)
W77-09029

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W77-09038

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W77-09040

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-09056

FLOOD-PLAIN DELINEATION FOR DIFFICULT RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-09071

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-09085

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09090

2F. Groundwater

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-08654

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 4B.
W77-08662

GROUND WATER BUDGET OF THE MOUNTAINOUS REGIONS OF HUNGARY, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
L. Szebenyi.
Magy All Foldtani Intez Evi Jel. 1971; p 221-228, 1973.

Descriptors: *Groundwater, Europe, Mountains, Infiltration, *Groundwater basins, *Base flow, *Karst hydrology, *Water yield, Mountains, Ephemeral streams, Karst, Hydrogeology.
Identifiers: *Hungary.

The dynamic ground water reserves of Hungary's basins were calculated in profiles plotted on the basin margins. The ground water reserves communicating through filtration in these profiles are complemented with the surplus of the infiltrated waters returning to the surface within the confines of the mountains. The quantity of ground waters infiltrating in the mountainous regions and returning to the surface in one and the same region is defined by the base flow of the water-courses. In Hungary, on the basis of the data so far available, this base flow is best characterized by the Aug. discharge of 85% frequency. Dividing this by the corresponding drainage area, one can obtain the hydrogeological characteristics of the region. Values higher than 150m3/day/km2 are characteristic of Mesozoic karstic areas; 50 to 150m3/day/km2 are uncharacteristic, occurring in areas of insignificant size; 21-50m3/day/km2 are characteristic of the Oligocene-Miocene areas of NE Hungary and of some volcanic zones; 10-20m3/day/km2 are most characteristic of the internal parts of most of the mountainuous regions, areas least-covered by Pleistocene; 10-15m3/day/km2 are characteristic of the less elevated parts of these regions, areas carrying a comparatively thicker loess-and-loam (red clay) overburden. Drainage basins having a module lower than 9m3/day/km2 occur on the margins of the mountains, where the debris cones appear. These data are characteristic of the drier late-summer period. In addition to this, the potential winter accumulation of water reserves in karstic areas is considerable, where winter accumulation attains about one and the half of the base flow yield.--Copyright 1974, Biological Abstracts, Inc.
W77-08663

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2K.
W77-08683

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
S. M. Born, S. A. Smith, and D. A. Stephenson.
An Inland Lake Renewal and Management Demonstration Project, 1974. 73 p, 14 fig, 6 tab, 90 ref, 1 append.

Descriptors: *Hydrogeology, *Groundwater, *Infiltration, *Hydrologic budget, *Soil water movement, *Surface water, *Lakes, Rainfall-runoff relationships, *Wisconsin, *Groundwater-surface water relationships, Planning, Natural resources, Water management(Applied).
Identifiers: *Regime dominance, *System efficiency, *Lake environments, Snake Lake Rehabilitation Project, Upper Great Lakes Regional Commission, Lake management.

Hydrogeologic information is not conventionally given adequate attention in planning and managing lake resources. The ground water regime in the vicinity of lakes is often unknown. The authors chose to study the hydrogeology in the glaciated, temperate states in the U.S. The objectives of the paper are: compile available hydrogeologic information; describe hydrogeologic aspects of lakes emphasizing ground water/surface water relationships; specify and classify critical hydrogeologic informational needs for evaluating lake environments; and show the utility of hydrogeological information for lake management and development activities. Hydrogeologic factors needed to assess lake environments are; regime dominance (relative magnitude of ground water in a lake's water intake); system efficiency (the rate of ground water/lake interchange); and position of a lake within a ground-water flow system. The Snake Lake rehabilitation project in northern Wisconsin and the planning of a recreational new town in northwestern Wisconsin illustrate the application of lake/ground-water information. (Gentry-NC)
W77-08724

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08734

GUIDE FOR DATA COLLECTION TO CALIBRATE A PREDICTIVE DIGITAL GROUND-WATER MODEL OF THE UNCONFINED AQUIFER IN AND NEAR THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
R. W. Page.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 602, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 76-41, February 1977. 46 p, 19 fig, 1 tab, 30 ref.

Descriptors: *Groundwater resources, *Model studies, *Hydrogeology, *Water table aquifers, *California, Alluvial aquifers, Groundwater movement, Pumping, Specific yield, Transmissivity, Groundwater recharge, Water levels, Specific retention.
Identifiers: *San Joaquin Valley(Calif), Modesto area(Calif).

The city of Modesto encompasses about 12 square miles in the northeastern part of the San Joaquin Valley, Calif. The ground-water model encompasses about 542 square miles. In the Modesto area, ground water occurs in an unconfined aquifer a confined aquifer. both of which are composed of unconsolidated materials, and a consolidated-rock aquifer. Only the unconfined aquifer was modeled, using several simplifying assumptions concerning hydrologic conditions in the ground-water basin. A program is used that computes the net rate of recharge and discharge under steady-state conditions. The model was then modified until reasonable values of recharge and discharge were computed. Testing of the model indicated that simulated water levels were especially sensitive to tansmissivity, storage coefficient, irrigation return, and riverbed hydraulic conductivity; amond the parameters that affected water levels least were the vertical hydraulic conductivity and specific storage of the confining bed, the so-called E-clay. (Woodard-USGS)
W77-08735

SIMULATIONS OF WATER-LEVEL DRAWDOWNS IN PROPOSED WELL-FIELD AREAS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08739

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08742

ARTIFICIAL RECHARGE FOR SUBSIDENCE ABATEMENT AT THE NASA-JOHNSON SPACE CENTER, PHASE I,
Geological Survey, Austin, Tex. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08744

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08753

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08807

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08829

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
T. R. E. Chidley, and J. W. Lloyd.
Ground Water, Vol 15, No 3, p 215-222, May-June 1977. 8 fig, 9 ref.

Descriptors: *Groundwater, *Islands, *Model studies, Mathematical models, Saline water-freshwater interfaces, Aquifers, Permeability, Water levels, Fluctuations, Water levels fluctuations, Groundwater movement, Groundwater recharge, Groundwater resources.
Identifiers: *Freshwater lenses, *Caribbean Sea, *Grand Cayman Island.

An analysis of the unsteady flow in a freshwater lens on a small tropical thickness. An alternative view of the problem to that most commonly given was presented. Results were shown for some lenses on Grand Cayman Island in the Caribbean Sea. The aquifer material is a micro-karst limestone. The chief result of engineering significance was that the conventional steady-state analysis was shown to be a sound basis for estimating the long-term yield if drought sequences are not long. (Sims-ISWS)
W77-08837

DIGITAL MODEL STUDIES OF STEADY-STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN ALLUVIAL PLAINS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Ground Water, Vol 15, No 3, p 223-230, May-June 1977. 5 fig, 4 tab, 4 ref.

Descriptors: *Groundwater, *Groundwater movement, *Water wells, *Model studies, Mathematical models, Drawdown, Wells, Water levels, Water table, Flow, Aquifers, Screens, Well screens, Permeability, Anisotropy, Pumping, Computer models.

A digital simulation model for the steady-state radial flow towards partially penetrating wells in the alluvial plains was presented. As the deposits in these plains are heterogenous with several good water-bearing formations crisscrossed with silty layers, the deposits were treated as a single anisotropic aquifer with water table conditions prevailing. The iterative alternate direction implicit technique was used for the solution of the steady-state flow. The digital simulation model was used to study the effects of anisotropy, screen setting, and screen length on the discharge per unit length of screen. The model also was used to evaluate the errors involved in determining lateral permeability from distance-drawdown data. The digital simulation model was applied to field pumptest data for purposes of identification of aquifer anisotropy and radius of influence of well; and the model was used in evaluation of errors in determining lateral permeability from distance-drawdown data. (Sims-ISWS)
W77-08838

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
C. W. Lenau.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12911, p 483-497, May 1977. 4 fig, 2 tab, 2 ref, 4 append.

Descriptors: *Underseepage, *Stratification, *Hydraulic structures, *Mathematical models, Equations, Groundwater movement, Underflow, Seepage, Permeability, Aquifers, Confined water, Artesian heads, Dams.
Identifiers: Boundary conditions.

A solution was developed for the discharge under a structure resting on N srrata of equal thickness. The solution was an asymptotic approximation of the exact solution for large values of the structure length. However, because neglected terms are exponentially small, the solution is accurate for a very wide range of conditions. Because successive strata can have equal permeability, the solution can be applied to almost any combination of strata thicknesses and permeabilities. (Visocky-ISWS)
W77-08843

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W77-08923

SHAPE OF A STREAMLINE WATER TABLE NEAR INFLOW AND OUTFLOW BOUNDARIES,
Illinois Univ. at Urbana-Champaign. Dept. of Agronomy.
C. W. Boast.
Water Resources Research, Vol 13, No 2, p 325-328, April 1977. 3 fig, 1 tab, 12 ref.

Descriptors: *Water table, *Shape, *Boundaries(Surfaces), *Flow nets, Mathematical models, Inflow, Discharge, Slopes, Equations, Graphical analysis, Dupuit-Forchheimer theory, Dams.
Identifiers: Streamlines, Hodographs.

A streamline water table usually is pictured to leave an inflow boundary perpendicular to the surface and to approach an outflow boundary tangential to the surface for vertical surfaces or for inclined surfaces with the porous medium 'below' the surface. The hodograph solution for the problem of flow through a vertical walled dam proved that, theoretically, the water table streamline leaves the inflow boundary horizontally and approaches the outflow boundary vertically. However, the solution shows that at a practical scale the water table meets the boundaries at finite nonzero slopes. The actual water table shape deviates considerably from the usual way that the water table is sketched. The cause of the difference lies in an intuitive but incorrect assumption that the slope of the water table does not change dramatically near the endpoints of the water table. (Visocky-ISWS)
W77-09023

TRANSIENT ANALYSIS OF PHREATIC AQUIFERS LYING BETWEEN TWO OPEN CHANNELS,
Punjab Agricultural Univ., Ludiana (India). Dept. of Soil and Water Engineering.
S. R. Singh, and C. M. Jacob.
Water Resources Research, Vol 13, No 2, p 411-419, April 1977. 3 fig, 1 tab, 16 ref.

Descriptors: *Aquifers, *Groundwater movement, *Hydrodynamics, *Model studies, Mathematical models, Groundwater, Channels, Hydraulic conductivity, Water table, Water levels, Precipitation(Atmospheric), Infiltration, Recharge, Withdrawal, Hydraulics.

The unsteady-state flow of water through an unconfined aquifer can be represented by the Boussinesq equation. The nonlinear term involving the highest derivative in this equation was approximated by a linear term, and the resulting ap-

proximate Bossinesq was linearized to a Fokker-Planck equation by the method of functional transformation. Solutions to the problem of groundwater flow through phreatic aquifers lying between (1) constant water level boundaries and (2) variable water level boundaries were obtained from the general solution of the Fokker-Planck equation for constant and variable rates of recharge and withdrawal. Variable rates of recharge and withdrawal were approximated by periodic step functions which represented two different rates, one each for both rainy and dry seasons. Variable water levels in the open channels were approximated by step functions, and the initial condition was represented by straight line segments. An analytical solution of the approximate Boussinesq equation was compared with the finite difference solution of the original Boussinesq equation. The difference between the two solutions was almost negligible, and therefore, the applicability of the analytical solutions to groundwater resource management was established. The effect of variable water level boundaries on groundwater dynamics was studied by performing a sample calculation. (Sims-ISWS)
W77-09026

GROUND WATER MODEL FOR THE ISLAND OF ANHOLT, DENMARK,
Roskilde Univ. Center. (Denmark).
N. Schroder, and H. Obro.
Nordic Hydrology, Vol. 7, No. 5, p 281-292, 1976. 11 fig, 6 ref.

Descriptors: *Groundwater, *Groundwater movement, Islands, *Model studies, Mathematical models, Saline water-freshwater interfaces, Recharge, Withdrawal, Groundwater recharge, Infiltration, Precipitation(Atmospheric), Sewage, Foreign countries, Foreign research, Cesspools, Geology, Hydrology, *Computer models.
Identifiers: *Anholt Island(Denmark), *Denmark, *Groundwater models.

The development and application of a digital computer model of the groundwater reservoir of the island of Anholt were described. The model was based on a finite difference, two-dimensional approach. It was used successfully to investigate if the groundwater at a planned well field might be polluted by sewage from nearby cesspools. Although the model was an approximation of the real aquifer conditions, the model was very useful, and it was suggested that modelling techniques be more widely used in groundwater resource investigations. (Sims-ISWS)
W77-09030

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W77-09031

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-09042

CHARACTER OF SEEPAGE OF PRECIPITATION TO THE WATER TABLE IN THE CENTRAL FOREST STEPPE,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
For primary bibliographic entry see Field 4B.
W77-09043

ARTIFICIAL RECHARGE TO A FRESH-WATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09066

ANALOG SIMULATION OF THE GROUND-WATER SYSTEM, YUMA, ARIZONA,
Geological Survey, Reston, Va. Water Resources Div.
E. P. Patten, Jr.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.35. Professional Paper 486-I, 1977. 10 p, 4 fig, 1 plate, 3 tab, 6 ref.

Descriptors: *Groundwater movement, *Analog models, *Arizona, *Mexico, *International Bound and Water Comm, Groundwater resources, Aquifers, Pumping, Water utilization, Irrigation, Water supply, Water demand, Projections, Groundwater availability.
Identifiers: *Yuma area(Ariz).

An electric analog model was used to simulate the ground-water system of the Yuma area, Arizona, and to predict the magnitude of southwesterly flow of ground water across the limitrophe section of the Colorado River. An evaluation of alternative ground-water recovery plans indicated that there would be little effect on the flow across the limitrophe section but a substantial decrease in flow across the Arizona-Sonora international boundary. (Woodard-USGS)
W77-09067

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

REPORT ON PRELIMINARY DATA FOR MADISON LIMESTONE TEST WELL NO. 1, NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROOK COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09072

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
R. G. Borman.
Wisconsin Geological and Natural History Survey, Madison, Information Circular No 34, 1976. 45 p, 24 fig, 1 plate, 2 tab, 33 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Aquifer characteristics, *Water quality, *Water utilization, Water wells, Water yield, Surface-groundwater relationships, Streamflow, Low flow, Chemical analysis.
Identifiers: *Walworth County(Wis).

In Walworth County, Wis., good-quality water is available from the sand-and-gravel, Niagara, Galena-Platteville, and sandstone aquifers. Yields of more than 1,000 gallons per minute are available from glacial drift where it contains a sufficient thickness of saturated sand and gravel. The Niagara aquifer is a dolomite that occurs in the eastern fourth of the county. It is capable of yielding over 100 gallons per minute. The Galena-Platteville aquifer is also a dolomite, but occurs in the west half of the county. It is capable of yielding over 500 gallons per minute. The sandstone aquifer underlies the entire county and is capable of yielding 1,000 gallons per minute to wells in the county. The sand-and-gravel and sandstone aquifers are the principal sources of municipal water. The chemical quality of water from the four aquifers is similar. Median values for hardness and dissolved solids range from 300 to 350 milligrams per liter. Iron and manganese are present in bothersome amounts. About 6.6 million gallons per day was pumped in the county in 1971, 53 percent from the sand-and-gravel aquifer and 41 percent from the sandstone aquifer. About 40 percent of the water pumped was for residential use and 38 percent was for industrial and commercial use. (Woodard-USGS)
W77-09081

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-09082

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09088

INTEGRAL EQUATION FOR THE DESCRIPTION OF STREAM-AQUIFER INTERACTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 123, Price codes: A02 in paper copy, A01 in microfiche. Report CEP74-75HJM35, Engineering Research Center, Colorado State University Fort Collins, January 1975. 21 p, 24 ref. OWRT B-109-Colorado(1). 14-31-0001-4067.

Descriptors: *Groundwater, *Surface-groundwater relationships, Aquifers, Base flow, *Equations, Flow systems, Pumping, Flooding.
Identifiers: Groundwater models, Flow routing, *Stream-aquifer interactions.

An integral equation is derived which completely characterizes the interaction between a stream and the alluvial aquifer. Expressed in finite difference form the equation is of great practical utility to solve pure flooding problems (negligible effect of pumping on river flows) as it relates river stages to return flows, or pure conjunctive use of surface and groundwater problems (negligible river stage fluctuations) as it relates return flows to pumping rates, or composite problems. The numerical procedures to calculate the response function coefficients in terms of the physical characteristics of the system are given in detail.
W77-09092

2G. Water In Soils

NITROGEN REMOVAL FROM SECONDARY EFFLUENT BY A LABORATORY SOIL COLUMN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-08607

THE EFFECT OF SOIL MOISTURE ON THE DEVELOPMENT OF SOIL MICROFLORA IN

CONDITIONS OF FIELD EXPERIMENTS, (IN SLOVAK),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
For primary bibliographic entry see Field 5B.
W77-08696

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W77-08706

STRENGTH OF SOIL AGGREGATES: INFLUENCE OF SIZE, DENSITY AND CLAY AND ORGANIC MATTER CONTENT,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
A. S. Rogowski, and D. Kirkham.
In: 3rd International Symposium on Soil Conditioning, Med. Fac. Landbouww. Rijksuniv. Gent 41/1-1976, p 85-100, 1 fig, 5 tab, 39 ref.

Descriptors: *Soil aggregates, *Soil strength, Size, Organic matter, Soil type, Raindrops, Impact(Rainfall), Cracks, Failure, Rill, Erosion, Soil density, Shear stress, *Iowa.
Identifiers: *Dry aggregate strength, Detachment(Soils), Soil conditioners, Wet aggregate strength.

Aggregates from the plowlayer of three Iowa soils were separated into several size-density groups by gravity fractionation. Carbon, clay, water stability and strength analysis were performed on each group. The density groups could best be described by ranges which showed some tendency to overlap. Aggregate strength decreased with size. Between the soils, large increases in clay content were accompanied by large increase in strength. Raindrop impact and associated shear stress is the principal mechanism of detachment. Processes which promote cracking within the soil mass are likely to facilitate detachment. It is hypothesized that rills are likely to develop on soils where low density values are distributed unevenly over an areal, particularly in the zones of streamline convergence. Use and development of soil conditioners to counteract the shear and seepage forces as well as to provide a skeletal structure for low density material is desirable. (ARS).
W77-08707

SOIL TESTING FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-08728

SOIL-MOISTURE STRESS AS RELATED TO PLANT-MOISTURE STRESS IN BIG SAGEBRUSH,
Geological Survey, Lakewood, Col. Water Resources Div.
F. A. Branson, and L. M. Shown.
Journal of Range Management, Vol 28, No 3, p 212-215, May 1975. 4 fig, 16 ref.

Descriptors: *Sagebrush, *Soil-water-plant relationships, *Moisture stress, *Evapotranspiration, *Plant growth, Seasonal, Fluctuations, Phenology, Watersheds(Basins), *Colorado, River basins.
Identifiers: *Internal-plant stress range, *Soil-moisture stress, Soil salinity, Leaf persistence, *Eagle River basin(Colo).

Seasonal variation in internal-moisture stress in big sagebrush (Artemisia tridentata Nutt.) is significantly related (correlation coefficient +0.68) to the lowest soil-moisture stresses in the soil profile. Seasonal values for internal-plant stresses range from 15.3 to 59.8 bars; for lowest soil stress the range was 0.2 to 36.4 bars. Hour of day, wind, and net radiation are also significantly related to internal-moisture stress in plants. The results presented support the hypothesis that inexpensive internal-plant stress measurements may be used to estimate soil-moisture stress and soil-moisture storage. (Woodard-USGS)
W77-08751

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08819

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2K.
W77-08822

EFFECTS OF SPATIAL VARIABILITY OF SOIL HYDRAULIC PROPERTIES IN WATER BUDGET MODELING,
Commonwealth Scientific and Industrial Research Organization, Wembley (Australia). Div. of Land Resources Management.
A. J. Peck, R. J. Luxmoore, and J. L. Stolzy.
Water Resources Research, Vol. 13, No. 2, p 348-354, April 1977. 4 fig, 4 tab, 22 ref.

Descriptors: *Soil properties, *Hydraulic properties, *Hydrologic budget, *Model studies, *Tennessee, Soil horizons, Hydraulic conductivity, Precipitation(Atmospheric), Rain-runoff relationships, Soil water, Soil profiles, Darcys law, Retention, Infiltration, Evapotranspiration.
Identifiers: Spatial variability, Scaling factor.

There is appreciable spatial variability of soil properties on the scale of a watershed or a field even in a single soil type. The spatial variation of soil water characteristics in an area was simulated from average properties and the assumption of scale heterogeneity. Simulated soil water characteristics and other data representing forest vegetation were used in a model to simulate water budgets over part of a watershed in eastern Tennessee for average April and July weather. Precipitation was assumed to be uniform over the area, and there was no runoff even from the least permeable soil during the months simulated. The spatial variability of soil water conditions had only a small effect on evapotranspiration. Water storage in the soil profile changed, so that the drainage flux beyond the root zone tended to become uniform throughout the area simulated. The characteristic microscopic length of the soil was assumed to be normally distributed in an area, and equations were developed for calculating average soil water characteristics from the retention curves and hydraulic conductivities of a number of soil samples. Components of the water budgets simulated with average soil water characteristics were in excellent agreement with the simulated behavior of the spatially variable soil unit as a whole. The result does not imply similar agreement for other distribution functions and soil-plant-weather combinatons, but the methodology developed may be applied to investigate similar problems. (Visocky-ISWS)
W77-08825

FLOW CHARACTERISTICS DURING INFILTRATION INTO A HORIZONTAL SAND COLUMN,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis.
Water Resources Research, Vol. 13, No. 2, p 369-374, April 1977. 9 fig, 13 ref.

Descriptors: *Infiltration, *Diffusivity, *Soil water movement, Soil water, Flow, Laboratory tests, Darcys law, Hydraulic conductivity, Permeability, Groundwater, Groundwater movement, Hysteresis, Soil moisture, Reynolds number, Tensiometers, Porous media, Soils.

Experimental water content profiles established during infiltration into a horizontal sand column were compared with theoretical profiles calculated from the soilwater diffusivity, which was determined independently of the infiltration process. Discrepancies between the theoretical and experimental profiles were found. In particular, the experimental profiles for small times showed a retardation of the penetration which became more pronounced as the water content increased, and no unique relationship between the water content and the variable lambda= x/sq root of t (x being the distance and t the time) was found. Thus, the experimental profiles gave incorrect and varying soilwater diffusivities. The comparison of the actual flow rate q with the rate q' given by the product of the hydraulic conductivity and the observed potential gradient showed that q= alpha q', where alpha is between 0 and 1, alpha varying with the water content and the potential gradient. The effect of the 'less than proportional' flow on the profile development was discussed. It was argued that the infiltration process at relatively late times was conditioned by the profile development during the very early stages. Previous experimental infiltration work was discussed, and it was argued that two mechanisms able to produce non-Darcian behavior may be responsible for the various reported infiltration patterns. Finally, the results of the present work were discussed in terms of a critical Reynolds number where the flow becomes non-Darcian. (Sims-ISWS)
W77-08826

WATER AND ICE POTENTIALS IN FROZEN SOILS,
Guelph Univ. (Ontario). Dept. of Land Resource Science.
For primary bibliographic entry see Field 2C.
W77-08828

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08829

RETENTION AND FLOW CHARACTERISTICS OF POLYMER SOLUTIONS IN POROUS MEDIA,
Kansas Univ., Lawrence.
J. G. Dominguez, and G. P. Willhite.
Society of Petroleum Engineers Journal, Vol 17, No 2, p 111-121, April 1977. 11 fig, 6 tab, 23 ref.

Descriptors: *Retention, *Flow, *Polymers, *Porous media, *Aqueous solutions, Porosity, Cores, Permeability, Laboratory tests, Dispersion, Laboratory equipment, Analytical techniques, Wettability, Velocity, Interstices.
Identifiers: *Linear displacement, *Teflon, Resistance factor, Mechanical entrapment.

Retention and flow characteristics of a solution containing Pusher 700, a high-molecular-weight, partially hydrolyzed polyacrylamide, were studied in an 86-md core made by compacting Teflon powder. The quantity of polymer retained during linear displacement experiments ranged from 10 to 21 microgram/gm for polymer concentrations of 100 to 500 ppm in 2% NaCl solutions. Nearly all retention was attributed to mechanical entrapment because of low polymer adsorption on the Teflon surface. Flow rate affected polymer retention. An increase in velocity was accompanied by polymer retention. Polymer was expelled when the flow

rate was reduced. Inaccessible pore volume was about 19% of the total pore volume. Resistance factors in different sections of the core ranged from 2 to 10 for solutions of 100 to 500 ppm polymer concentration in 2% NaCl. Permeability reduction resulting from polymer retention produces the resistance factor in most of the core at a velocity of 3.2 ft/D. Resistance factors in the Teflon cores were 2 to 3 times lower than those reported for natural porous media where polymer is also retained by adsorption. (Visocky-ISWS)
W77-08850

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
J. C. Bruch, Jr., G. Zyvoloski, and J. M. Sloss.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 999, Price codes: A06 in paper copy, A01 in microfiche. College of Engineering, (UCSB-ME-75-2), August, 1975. 100 p, 8 fig, 1 tab, 17 ref, append. (California Water Resources Center Project UCAL-WRC-W-336). OWRT A-039-CAL(12).

Descriptors: *Finite element analysis, *Mathematical studies, *Analytical techniques, *Unsaturated flow, *Groundwater movement, Computer programs, Equations, Methodology, Moisture content, Loam, Sands, Clays, Soils.

The two-dimensional partial differential equation describing the movement of groundwater is investigated using the finite element method. The relevant finite element theory is introduced using the two-dimensional linear diffusion equation and then applied to the unsaturated flow equation. The technique employed to solve the equation utilized isoparametric finite elements of the linear or quadratic type. The approach consists of expanding the nonlinear terms in shape functions and employing successive substitution until a fixed error criterion was satisfied. Convergence is usually very fast. Several examples are given comparing the results obtained to similar studies using finite difference techniques. A sample computer program is also provided. The theoretical questions of uniqueness and convergence are considered in detail and a rigorous derivation of error estimates is presented. (Snyder-California, Davis)
W77-08923

PROBLEMS OF OPTIMUM SOIL MOISTURE LEVEL: DETERMINATION AND CONTROL, (IN RUSSIAN),
Moscow State Univ. (USSR).
I. I. Sudnitsin, N. A. Muromtsev, and M. E. Ginzburg.
Vestn Mosk Univ Ser 6 Biol Pochvoved. 29(3), p 32-42, 1974.

Descriptors: *Soil moisture, Transpiration, Soil moisture meters, Loam, Sands, Soil types, Plant physiology.
Identifiers: *Optimum soil moisture.

To find the optimum range of soil moisture for plants, the relationships between soil moisture availability for plants (relative transpiration) and soil moisture potential must be determined. These relationships are not the same for various plants and environments. Soil moisture availability at the same potential is higher for xerophytic than mesophytic and hydrophytic plants; for plants grown on loamy than on sandy soils; for plants with dense roots; for plants during middle stages of their growth; for plants which had survived previous droughts.--Copyright 1975, Biological Abstracts, Inc.
W77-08952

INFILTRATION EQUATIONS FOR SIMPLE SOIL SYSTEMS,
Sydney Univ. (Australia). Dept. of Soil Science.
N. Collis-George.
Water Resources Research, Vol 13, No 2, p 395-403, April 1977. 3 fig, 1 tab, 24 ref.

Descriptors: *Infiltration, *Soil properties, *Model studies, Mathematical models, Equations, Soils, SOil water, *Soil water movement, Hortons law, *Infiltration rates, Dispersion.
Identifiers: Green-Ampt equation, Fokker-Planck equation, van der Want equation.

Empirical equations and physically based equations used to describe vertical infiltration into simple soil systems were compared with experimental data. An empirical equation was proposed which satisfies the conditions that cumulative infiltration is proportional to the sq root of time at short times and reaches a steady-state infiltration rate at long times. The equation, i = i sub o (sq root of tanh T) + Kt, describes the observed behavior of simple soil systems at all times; where i is the cumulative infiltration at time t, K is the infiltration rate at steady-state, i sub o = S(sq root of t sub c), and T = t/t sub c. The sorptivity, S, and a time parameter, t sub c, are soil properties determinable experimentally. The Green and Ampt equation and the Horton equation do not satisfy observed behavior at all times, the former failing at long times and the latter at short times. The equation of van der Want, the linearized Fokker-Planck equation of Philip, and the nonlinearized Fokker-Planck equation of Knight and Philip do not describe the observed behavior of simple soil systems over the whole time range as precisely as the proposed empirical equation. Since i sub o is not an independent part of the equations, its numerical value is defined by the independent parameters S and K; and for the materials examined, the numerical value is generally not the same as the experimental value. Procedures were outlined for treating experimental data, not necessarily complete for all times, to produce the three parameters, K,S, and t sub c for simple systems, and for description infiltration into cracking clays or in cases where ultrashort time effects occur. (Sims-ISWS)
W77-09025

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W77-09041

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09054

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09064

2H. Lakes

A PRIMER ON LIMNOLOGY,
Minnesota Univ., Minneapolis. Linmological Research Center.
J. B. Lundquist.
Available from the National Technical Information Service Springfield, VA as PB-268 778, Price codes: A03 in paper copy, A01 in microfiche. University of Minnesota, Water Resources Research Center, Minneapolis, Public Report Series Number 1, August 1975. 28 p. OWRT A-999-MINN(38).

Descriptors: *Limnology, *Lakes, Eutrophication, Pollution.

This publication provides an introduction to limnology, identifies some of the lake problems that are influenced by human activities, and outlines some prodcedures for studying individual lakes. This is an introduction to Limnology and it should be comprehensible to readers with junior high and high school science background.
W77-08605

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08608

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
For primary bibliographic entry see Field 5G.
W77-08631

FISH FAUNA OF LAKES OF THE LOWER REACHES OF THE ZARAFSHAN RIVER AND ITS FISHERY USE, (IN RUSSIAN),
Bukharskii Gosudarstvennyi Pedagogicheskii Institut (USSR).
M. A. Abdullaev, and D. Urchinov.
Uzb Biol Zh 19(5); p 54-56, 197[illegible].

Descriptors: *Commercial fish, *Lakes, *Fisheries, *Lake fisheries, Reservoirs, Freshwater fish.
Identifiers: Acipenseridae, Cobitidae, Cyprinidae, Gobiidae, Percidae, Poecilidae, Siluridae, USSR, Uzbek SSR, Zarafshan River.

Reservoirs and lakes play a major role in fishery in the lower reaches of the Zarafshan River in the Uzbek SSR (USSR). Fishes (28 spp.) belonging to 7 families (Acipenseridae 1 sp.), Cyprinidae (19), Cobitidae (3), Siluridae (1), Poecildae (1), Percidae (2), Gobiidae (1) inhabit these lakes. The most important fisheries are indicated and some data are given on commercial fish species.--Copyright 1976, Biological Abstracts, Inc.
W77-08708

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-08710

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.

For primary bibliographic entry see Field 7B.
W77-08752

THE EFFECT OF THE IMPOUNDMENT OF LAKE KAINJI, NIGERIA, ON THE INDIGENOUS SPECIES OF MORMYRID FISHES,
Reading Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08772

A STUDY OF HEAVY METALS IN LAKE ABBAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
For primary bibliographic entry see Field 5A.
W77-08774

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

DENSITY AND DISTRIBUTION OF BENTHOS IN LAKE KEOWEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08818

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-08824

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
For primary bibliographic entry see Field 4A.
W77-08834

ROLE OF RIVER RUNOFF AND OF WATER EXCHANGE IN THE SALINITY OF THE NORTHERN CASPIAN SEA,
Ye. G. Arkhipova, D. N. Katunin, V. V. Kryukov, and Yu. A. Khvatskaya.
Soviet Hydrology, Selected Papers, No 4, p 300-309, 1975. 5 fig, 10 tab, 7 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No 125, p 125-144, 1975.

Descriptors: *Runoff, *Estuaries, *Salinity, Rivers, Freshwater, Surface runoff, Sea water, Salts, Foreign countries, Foreign research, Spatial distribution, Temporal distribution, Water levels, Oceanography.
Identifiers: *Caspian Sea, *Volga River, *USSR, Salinity distribution, Salinity variations.

Despite the relatively large number of papers devoted to the salt regime of the northern Caspian Sea, the origin of salinity requires further study because of the complexity of the phenomenon. The roles of river runoff, wind, and salt exchange with the central Caspian Sea in the origin of the salinity field of the northern Caspian Sea were identified on the basis of a study of the space-time variations of salinity from observational data for 1940-1971. The possible future salinity distribution after a reduction in river runoff volume was determined. (Sims-ISWS)
W77-08836

THE USE AND MISUSE OF PURE WATER PVT PROPERTIES FOR LAKE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
C-T. Chen, and F. J. Millero.
Nature, Vol. 266, No. 5604, p 707-708, April 21, 1977. 1 fig, 17 ref.

Descriptors: *Lakes, *Water properties, *Salts, Temperature, Water temperature, Pressure, Volume, Density, Salinity, Water quality, Limnology.

Although dissolved substances affect the thermodynamic properties of lake waters, many limnologists still consider lake water as pure water. This can be a good assumption if used with caution: lake water is by no means pure water, especially when the precise pressure, volume, temperture (PVT) properties are considered. PVT properties of lake water can be determined from an equation of state for seawater, provided that the total mass fraction of dissolved salts in seawater and lake water are equated. In addition, the total mass fraction of dissolved salts affects calculations concerning the temperature of maximum density and thus stability. Therefore, in the absence of direct PVT measurements on a particular lake, it is at present most appropriate to use an equation of state for seawater when examining effects of PVT properties in lakes. Presented here was a short equation of state determined with a precision of 0.000002 g/cu cm in density over the appropriate range for most freshwater lakes, 0-0.6 parts per thousand salinity, 0-30 C, and 0-180 bar. (Sims-ISWS).
W77-08840

INLAND WATERS. MONOGRAPHS FROM LIMNOLOGY AND RELATED AREAS, VOL. 26, PART 1. THE ZOOPLANKTON OF INLAND WATERS,
H. Rick.
E. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, West Germany. 1972, 294 p.

Descriptors: *Freshwater, *Zooplankton, *Systematics, *Lakes, Limnology, Ecology.
Identifiers: Chaoboridae, Craspedacusta sowerbii, Hydrachnellae, *Inland waters, Keys, Mollusca, Mysidacea, Ostracoda, Rotatoria, Taxonomy.

This book presents monographs on planktonic Testacea and Heliozoa, Ciliata, fresh water medusae, specifically Craspedacusta sowerbii, Rotatoria, Ostracoda, Mysidacea, Chaoboridae, Hydrachnellae and Mollusca from inland waters. Morphology, biology, ecology, taxonomic and systematic data, including keys to genera and species, and distribution are discussed. A bibliography is found with each article, and an index of genera is included.—Copyright 1973, Biological Abstracts, Inc.
W77-08861

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst, Water Resources Research Center.
B. B. Berger, J. A. Kusler, and S. Klinginer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 014, Price codes: A12 in paper copy, A01 in microfiche. Publication No. 69, Technical Report, February 1976. 224 p, 38 ref. OWRT A-075-MASS(2).

Descriptors: *Conferences, Water quality, Lakes, *Lake shores, *Management, *Water pollution control, *Path of pollutants, Institutions, Water policy, Wisconsin, Massachusetts, Minnesota, Maine, *Environmental effects, Data collections, Zoning, Legal aspects, *Forecasting.
Identifiers: *Lake restoration, *Lake-shoreland management.

The collection of papers and abstracts were presented by speakers in a lake-shoreland management seminar conducted by the University of Massachusetts Water Resources Research Center on the Amherst campus during the spring 1975: Issues, Approaches, and General Recommendations for Lake Shoreland Management Programs, by Jon A. Kusler; Problems of Lake Quality, by A. F. Bartsch; Massachusetts Division of Water Pollution Control Lakes Study Programs, by John R. Elwood; The Minnesota Shoreland Zoning Program, by Michael Hambroke; Data Collection and Management: A Look at Maine's Lake Program, by Matthew Scott; Shoreland Management in Maine, by Millard W. Hall; Reconnaissance study of Lakes in Washington, by Gilbert C. Bortleson; Determining the Capacity of Lakes for Development, by Peter J. Dillon; Techniques for Predicting Physical Process within Lakes, by Peter A. Mangarella; Predicting the Fate and Behavior of Chemical Species in Lakes, by Stuart Ludlam; Techniques for Predicting Behavior and Fata of Chemical Substances in Lakes, by Francis A. DiGiano; Lake Policies and Institutions for Massachusetts, by Andrew J. W. Scheffey; Lake Management Institutions in Massachusetts, by Emerson Chandler; and The Wisconsin Inland Lake Demonstration Project, by Stephen M. Born. One of the three appendices contains information on Lake-Shoreland Management Statutes.
W77-08924

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08930

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-09021

ESTIMATION OF WINDS OVER THE GREAT LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
D. T. Resio, and C. L. Vincent.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12951, p 265-283, May 1977. 13 fig, 30 ref, 1 append.

Descriptors: *Winds, *Great Lakes, *Coastal engineering, Numerical analysis, Model studies, Equations, Surges, Estimating equations, Winds, Velocity, Lakes, Mathematical models, Wind pressure, Wind velocity, Theoretical analysis.
Identifiers: Geostrophic wind, Wind estimates.

Past efforts to estimate wind speeds over a large lake have met with very limited success. The purpose of this study was to demonstrate that, with a combined theoretical-empirical approach, winds over a lake can be obtained from transformed wind speeds at nearby land stations. The theoretical results provided a basis for comparison of many empirical data sets and established a rational means of analyzing the expected differences between winds over land and winds over a marine surface, which, in turn, afforded a means of examining systematic variations in the ratio of wind speeds over a lake to wind speeds over land. The good agreement between theory and observation indicated that wind estimates over the lake could be made for a wide range of synoptic conditions with an rms error of 5 knots. The theoretical curve

for the lake wind/land wind ratio provided an estimate of lake winds well beyond wind speeds for which there were good empirical data. (Roberts-ISWS)
W77-09022

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-09028

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
G. S. Bremmeng, and A. E. Kloster.
Nordic Hydrology, Vol. 7, No. 5, p 307-320, 1976. 7 fig, 4 tab, 18 ref.

Descriptors: *Groundwater, *Lakes, *Physical properties, *Chemical properties, *Sulfates, Surveys, Measurement, Groundwater movement, Precipitation(Atmospheric), Temperature, Water temperature, Oxygen, Foreign countries, Foreign research, Alkalinity, Hydrogen ion concentration, Conductivity, Calcium, *Oxidation-reduction potential, Chemicals, Stratification.
Identifiers: *Transjoen Lake(Norway), *Norway.

Transjoen, a lake in S. E. Norway investigated hydrographically from October 1969 to October 1971, consists of two basins, both of which are meromictic (lake with lower layer which does not participate in the periodic circulations). The lake has a large influx of groundwater of varying chemical composition. The calcium content is high, and precipitated calcium carbonate and electrolyte rich groundwater is assumed to be the main reason for the meromictic stability. The redox potentials of monimolimnion (the lower layer which does not participate in the periodic circulation) are extremely low, but in spite of this fact, the content of sulphate is high. (Sims-ISWS)
W77-09031

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-09059

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
For primary bibliographic entry see Field 5A.
W77-09065

LIMNOLOGICAL INVESTIGATION OF SIX LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.; and Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 7C.
W77-09069

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

2I. Water In Plants

DISTRIBUTION OF CORN ROOTS IN SANDY SOIL WITH A DECLINING WATER TABLE,
Agricultural Research Service, Mandan, N.D. Northern Great Plains Research Center.
R. F. Follett, R. R. Allmaras, and G. A. Reichman.
Agron J. 66(2), p 288-292, 1974.

Descriptors: *Water table, *Root distribution, *Crop response, *Soil moisture, *Root development, *Water levels, Evapotranspiration, Crop production, Plant growth, Regression analysis, Water requirements, Oxygen, Sands, Depth, Root zone.
Identifiers: Corn, Corn roots, Sandy soil, Zea mays.

Knowledge of root response to declining water tables is important for proper crop production management. Roots from 10 monoliths (91 cm deep), centered over and perpendicular to the corn (Zea mays L.) row, were obtained at about full silk (Aug. 26) from corn growing in 91-cm rows. Water table depths ranged 1.33-2.64 m at silking after declining at the rate of about 1.3 cm/day since July 1. About 20% of the evapotranspiration was supplied by natural precipitation with the remaining 80% from soil water depletion and the water table for the period July 1-Sept. 16 (final harvest). Shoot growth was maximum at intermediate water table depths. An equation describing root distribution was obtained from a regression fit of root depth (Y) as a function of water table depth (X1) and cumulative root weight (X2). A similar fit was made using root length as X2. In no case was more than 10% of the total measured root weight or more than 20% of the total measured root length below 75 cm. The distribution of roots with depth indicates water requirements for corn in these sandy soils must be supplied to a root zone with maximum depth of about 100 cm. Retarded root growth was observed where soil O2 diffusion rate (ODR) was less than 26 g/cm2/108 min. Such ODR values were obtained at depths greater than 30 cm at the shallow water table site. Apparent normal root development occurred when ODR values were greater than 30 g/cm2/108 min and matric suctions were about 100 mbar.
W77-08676

EFFECT OF WATER DEFICIENCY ON THE GROWTH RATE OF SOME WINTER SOFT WHEAT CULTIVARS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sadovo. Agricultural Experimental Station.
For primary bibliographic entry see Field 3F.
W77-08716

SOIL-MOISTURE STRESS AS RELATED TO PLANT-MOISTURE STRESS IN BIG SAGEBRUSH,
Geological Survey, Lakewood, Col. Water Resources Div.
For primary bibliographic entry see Field 2G.
W77-08751

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
For primary bibliographic entry see Field 2K.
W77-08822

EVALUATION OF WHEAT PLANTS WITH REGARD TO DROUGHT- AND HEAT-RESISTANCE UNDER FIELD CONDITIONS, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Botaniki.
For primary bibliographic entry see Field 3F.
W77-08877

ZOOPLANKTON DEVELOPMENT IN INTENSIVELY EXPLOITED FISHERY PONDS, (IN RUSSIAN),
Moscow State Univ. (USSR).
T. S. Mal'Tsman.
Gidrobiol Zh. 10(2), p 36-41, 1974.

Descriptors: *Zooplankton, Fisheries, Ponds, *Biomass, Carp, Fry, Plankton.
Identifiers: Aristichthys-nobilis.

Zooplankton development in intensively exploited fishery ponds is distinctly dependent on its rate of consumption by fish. Consumption of 200 kg/ha (density of carp fry, 80,000 individuals/ha) has no negative effect on zooplankton development. The zooplankton biomass decreases only with joint rearing of Cyprinus carpio and Aristichthys nobilis (at more than 1000 individuals/ha) when the consumption rate increases to 300-400 kg/ha/season (10-20% of average daily biomass). In this case, the relationship of total consumption to the average daily biomass is close to the P/B (production/biomass) coefficient of zooplankton.--Copyright 1975, Biological Abstracts, Inc.
W77-08945

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
For primary bibliographic entry see Field 5B.
W77-09056

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
W. H. Tarplee, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 104, Price codes: A04 in paper copy, A01 in microfiche. M. S. Thesis, 1975. 66 p, 6 fig, 17 tab, 22 ref, append. OWRT B-049-NC(2), 14-31-0001-3626.

Descriptors: *Surveys, *Swamps, *Fish populations, Freshwater fish, Warm-water fish, Trapping, *Fish types, Pounds fish per acre, Number fish per acre, *North Carolina, Streams.
Identifiers: *Duke Swamp(NC), *Hoggard Mill Creek(NC), Unchannelized wetlands, Fish species.

Fish populations were examined in two northeastern North Carolina swamp stream ecosystems from March through August 1972. The abundance of fishes susceptible to wire trapping was estimated during March and April by the Schnabel method. During low water conditions in June, July, and August abundance was estimated by the Petersen technique based on fishes collected with wire traps, gill nets, seines, and an electrofishing unit. Relative abundance of the various species captured during March and April was determined, and a rotenone sample was collected during August. Comparisons were made of fish species and numerical abundance of fishes between Hoggard Mill Creek and Duke Swamp, two unchannelized wetland areas. The study was one part of a prechannelization analysis to assess the effects of stream channelization and wetland drainage on fish and wildlife. (Stewart-NC State)
W77-09062

2J. Erosion and Sedimentation

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: IV: ASSESSMENT OF SOIL EROSION UNDER

VARIED LAND MANAGEMENT AND VEGETATION COVER;
Institute for Agricultural Research, Zaria (Nigeria).
For primary bibliographic entry see Field 4D.
W77-08698

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-08741

HYDROLOGIC CHANGES AFTER LOGGING IN TWO SMALL OREGON COASTAL WATERSHEDS,
Geological Survey, Portland, Oreg. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-08746

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
T. C. Winter, and H. E. Wright, Jr.
EOS, Vol 58, No 3, March 1977. American Geophysical Union, p 188-196, 1977. 6 fig, 27 ref.

Descriptors: *Paleohydrology, *Paleolimnology, *Lake sediments, *Sedimentology, Watershed management, Planning, Hydrology, History, Sedimentation rates, Palynology, Dating, Trophic level, Microbiology, *Minnesota, Lakes, Marshes.
Identifiers: *Lake Carlson(Minn), *Kirchner Marsh(Minn).

To understand and predict the magnitude and recurrence of dynamic hydrologic phenomena, especially for events that have a recurrence interval of one hundred years or more, indirect methods of determining hydrologic fluctuations must be used. Lake sediments contain a hydrologic record extending thousands of years into the past. Pollen and seed remains in the sediment of Lake Carlson and Kirchner Marsh, Minnesota, suggest that four droughts with a recurrence interval of 300 to 1,000 years occurred in that vicinity between 5,000 and 7,000 years ago. Pollen, seeds, leaves, diatoms, and other plant, animal, and chemical remains can be used to determine past lake levels, trophic conditions, and changes in sedimentation rates. The effects of land disturbances on lakes and their drainage basins can be assessed. In many cases, abrupt changes in types or abundance of fossils clearly mark the onset of land disturbances, and sedimentation rates usually increase significantly. Through sediment studies, it is possible to determine patterns of predisturbance water-level fluctuation and trophic conditions. This information, which is usually not available from written records, can be used to assess the magnitude of the disturbance, and it provides goals for lake management. (Woodard-USGS)
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-08752

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-08754

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W77-08815

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
For primary bibliographic entry see Field 2L.
W77-08847

GRAIN-SIZE PARAMETERS OF INSOLUBLE RESIDUES IN MIXXED TERRIGENOUS-SKELETAL CARBONATE SEDIMENTS AND SEDIMENTARY ROCKS: SOME NEW ZEALAND EXAMPLES,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
For primary bibliographic entry see Field 2L.
W77-08848

PRESENT-DAY SLUMPING AND EROSION PHENOMENA ON IRRIGATED LANDS (EXEMPLIFIED BY SOUTHEASTERN CISCAUCASIA), (IN RUSSIAN),
Industrial Research Inst. of Engineering, Survey and Construction, Stavropol (USSR).
V. A. Vasil'Ev.
Izv Sev Kavk Nauchn Tsentra Vyssh Shk Estestv Nauki. 1, p 57-59, 1974.

Descriptors: *Erosion, *Irrigated lands, Loess, Gullies.
Identifiers: Exemplified, *Slumping(Erosion), *USSR(Southeastern Ciscaucasia), *Anthropogenic processes.

Discussions are presented on the anthropogenic relief-forming processes occurring on irrigated lands composed of loess deposits: slumping on irrigation canals and irrigated fields, piping and erosion phenemona, formation of gullies, sheet erosion and irrigation erosion. The anthropogenic processes constitute the main factor in relief formaton.--Copyright 1975, Biological Abstracts, Inc.
W77-08885

MEANS AND METHOD FOR CONTROLLING BEACH AND SANDBAR EROSION,
For primary bibliographic entry see Field 8B.
W77-08894

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-08908

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08911

DESIGNING FOR SEDIMENT TRANSPORT,
Army Engineer District, Kansas City, Mo.
For primary bibliographic entry see Field 4D.
W77-08962

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
For primary bibliographic entry see Field 2L.
W77-09019

EFFECT OF SEDIMENT LOAD ON STABLE SAND CANAL DIMENSIONS,
Roorkee Univ. (India), Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-09020

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
For primary bibliographic entry see Field 5B.
W77-09024

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
For primary bibliographic entry see Field 8B.
W77-09038

FLOW REGIMES IN DEBRIS FLOW,
State Univ. of New York at Binghamton.
P. Enos.
Sedimentology, Vol 24, No 1, p 133-142, February 1977. 4 fig, 27 ref. NSF GA-28 621.

Descriptors: *Flow characteristics, *Laminar flow, *Sediments, *Reynolds number, *Boundary layers, Slurries, Turbulent flow, Sewage sludge, Velocity, Froude number.
Identifiers: *Debris flow, *Bingham number, Plastic flow, Clasts.

The Bingham model was suggested for the rheological behavior of debris flow. Velocity plotted against yield strength uniquely defines turbulent and laminar flow in published experimental data on flow of Bingham materials. The regimes are not defined by a unique value of the Bingham number even though it includes both of the critical parameters, yield strength and velocity. Laminar flow in at least the final stages natural debris flows is suggested by sediments with parallel-to-flow or inclined clast fabris, preservation of delicate clasts, blocks projecting from the top of the deposit and an absence of flutes. (Singh-ISWS)
W77-09045

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
For primary bibliographic entry see Field 2L.
W77-09089

2K. Chemical Processes

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
1976. 143 p. IAHS-AISH Publication No 119, Proceedings of the Grenoble Symposium, August/September, 1975.

Descriptors: *Geothermal studies, *Conferences, *Thermal water, Heated water, *Geochemistry, Thermal pollution, Water pollution, *Distribution, Path of pollutants, Reviews.

The International Commissions on Subsurface Water and Water Quality, both of IAHS, were responsible for the symposium reported. The proceedings includes 15 papers by authors from USSR, United States, France, Greece, India, Japan, New Zealand, Poland, Romania, and Taiwan. The papers discuss the geochemistry, distribution, and utilization of thermal waters throughout the world. (See W77-08678 thru W77-08691) (Chilton-ORNL)
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 5B.
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 5B.
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.
For primary bibliographic entry see Field 5B.
W77-08680

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
R. B. Scott, and A. Hajash, Jr.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 35-46, 4 fig, 1 tab, 51 ref. NSF GA 3545 & DES 74-18567.

Descriptors: *Geochemistry, Hydrology, *Heated water, Chemistry, Hydrothermal studies, Flow, Geology, *Atlantic Ocean, *Thermal water.

Evidence is presented which indicates extensive hydrothermal activity at oceanic spreading centers. Manganese oxides at the study site were found to have chemistries similar to hydrothermal manganese and growth rates two orders of magnitude faster than hydrogenous ferromanganese. Thermal activity which has continued at least sporadically for 100,000 years is indicated by the occurence of hydrothermal crusts coated with hydrogenous crusts. Experimental reactions between seawater and basalt also confirm hydrothermal activity. It was concluded that hydrothermal fluids rise through temperature, pressure, oxygen fugacity and sulfur fugacity gradients with fault zones in the rift valley wall acting as migration paths for the fluids. (See also W77-08677) (Chilton-ORNL)
W77-08681

GEOCHEMISTRY OF THERMAL WATERS FROM VARIOUS GEOTHERMAL PROVINCES OF INDIA,
National Geophysical Research Inst., Hyderabad(India).
M. L. Gupta, H. Narain, and V. K. Saxena.
In: Thermal and Chemical Problems of Thermal Water, Proceedings of the Grenoble Symposium, August/September, 1975. p 47-58, 3 fig, 3 tab, 12 ref.

Descriptors: *Geothermal studies, Geology, *Geochemistry, Heated water, Energy, *Thermal water.
Identifiers: *India.

Data analysis has shown the existence of several geothermal provinces of India with sub-surface thermal waters of varying chemical characters. These include the Himalayan Orogen Geothermal Province, the Konkan Geothermal Province and the Cambay Geothermal Province. Geodata indicated the earth's heat is a viable source of future energy development in India. (See also W77-08677) (Chilton-ORNL)
W77-08682

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
G. V. Bogomolov, and Y. G. Bogomolv.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 59-67, 3 fig, 2 ref.

Descriptors: *Hydrothermal studies, *Geochemistry, Hydrology, Geology, *Thermal water, Heated water, *Distribution.
Identifiers: Cold water.

Analysis of distribution of a natural thermal field and geothermal field on the surface of a crystalline foundation is used to outline some general regularities involved with geothermic and hydrochemical zonation intimately related to geologic structures. (See also W77-08677) (Chilton-ORNL)
W77-08683

GEOCHEMISTRY AND ORIGIN OF THERMAL WATERS IN POLAND,
Polish Academy of Sciences, Warsaw. Inst. of Geological Science.
J. Dowgiallo.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 69-77, 2 fig, 2 tab, 9 ref.

Descriptors: *Geothermal studies, *Hydrothermal studies, *Geochemistry, Heated water, Brines, *Thermal water.
Identifiers: *Poland.

Two hydrochemical types of thermal waters (brines characteristic of deep sedimentary aquifers of the North-European Lowland and the Flysch Carpathians and the slightly mineralized waters of the Inner Carpathians and the Sudetic granites and gneisses) are identified. The brines are identified as being mainly of relict/connate/or mixed origin. The Carpathian and Sudetic 'acratothermae' are infiltration waters. (See also W77-08677) (Chilton-ORNL)
W77-08684

THERMAL WATERS IN TAIWAN, A PRELIMINARY STUDY,
Mining Research and Service Organization, Taipei (Taiwan).
For primary bibliographic entry see Field 4B.
W77-08685

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
M. Schoeller.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium August/September, 1975. p 89-99, 3 fig, 5 ref.

Descriptors: *Geochemistry, *Geothermal studies, *Temperature, *Silica, Heated water, *Thermal water, *Mineral water, Correlation analysis, *Sodium, *Bicarbonates.
Identifiers: *France(Pyrenes), *Hot mineral water.

The study explores the correlation between silica content and temperature. Data from geochemical study of hot springs in the Pyrenees show that sodium and potassium also influence silica content. The springs studied all had temperatures below 80 C and flowed from crystalline rocks, granite, gneiss. (See also W77-08677) (Chilton-ORNL)
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
T. Bandrabur, and P. Craciun.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 110-118, 11 fig, 6 ref.

Descriptors: *Geothermal studies, *Geology, Hydrothermal studies, Chemistry, Mineralogy, Water chemistry, Heated water, *Thermal water.
Identifiers: *Romania(Pannonian Depression).

The geologic structural, geothermic and hydrogeological condition in the eastern part of Pannonian Depression are presented. The chemical composition of water (mineralization degree, ionic composition, and hydrochemical type as well as the origin of the mineralization and gaseous composition) from the Pontian, Pannonian, Miocene, Cretaceous and Triasic is discussed. (See also W77-08677) (Chilton-ORNL)
W77-08688

STUDIES BY THE DYNAMIC METHOD ON THE REACTION OF ROCK WITH HOT SPRING WATER OF THE TAMAGAWA HOT SPRINGS IN JAPAN,
Toho Univ., Tokyo (Japan). Dept. of Chemistry.
I. Iwaji, Y. Yuzo, Y. Seiko, and O. Teiko.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 119-127, 4 fig, 4 tab, 22 ref.

Descriptors: *Geothermal studies, *Geochemistry, *Hot springs, *Rocks, Chemistry, Water chemistry, *Heated water, Thermal water.
Identifiers: *Japan.

Variations in concentrations of rock components in hot spring water after reaction with water and rock were determined. Generally, concentrations of each component of rock in the hot spring water increased with the lapse of reaction time and reached maximum concentrations of up to 650mg/l in less than 20 minutes to several hours. After this the concentrations decreased according to the nature of the components in rock and water. Generally, extraction of components into hot spring water was effective only at the earlier stage of interaction of rock and water. (See also W77-08677) (Chilton-ORNL)
W77-08689

IMPORTANT GEOTHERMAL SITES IN GREECE, ON THE BASE OF THERMOMINERAL SPRING LAYINGS, AND THE POSSIBILITIES OF THEIR EXPLOITATION AND UTILISATION,
National Technical Univ., Athens (Greece). Institute of Mineral Layings, Science and Applied Geology.
For primary bibliographic entry see Field 4B.
W77-08690

TOTAL ENERGY USE IN AN URBAN-AGRICULTURAL POWER PLANT COMPLEX,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W77-08691

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
R. K. Stoessell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 812, Price codes: A08 in paper copy, A01 in microfiche. M. S. thesis, December 1974. 136 p, 34 fig, 12 tab, 58 ref, 3 append. OWRT A-031-LA(1).

Descriptors: *Ion exchange, *Cation adsorption, *Water softening, *Waste disposal, Aquifers, Injection, Diffusion, Sandstones, Porosity, Porous media, Diffusivity, Storage.
Identifiers: Artificial quartz sandstone.

Integral diffusion coefficients were measured at 35 C in the interstitial solution of an artificial quartz sanstone. The porous medium was chemically inert, had a porosity of 29.3%, an average grain size of 200 microns and a formation factor of 11.44. The diffusion coefficients range from 0.0000012 sq cm/sec for CaC12 solution to 0.0000022 sq cm/sec for NaCl solution. The flux was measured per unit area of liquid saturated pore space. A preliminary study of diffusion in an interstitial solution of artificial sea water indicated that diffusion processes deprese the ion/C1(-) ratio for Ca(++), Mg(++) and S04(--) and increase the ratio for K(+) and Na(+). The relative rates of diffusion in sea water were K(+) Na(+) C1(-) Ca(++) Mg(++) S04(--). Two quantitative evaluations were made on the effect of diffusion in the storage of fresh water in salt water aquifers. The first treatment was concerned with diffusion of Na(+) from the confining shales. The second treatment also took into consideration the release of Na(+) from exchange sites within the shales. The second treatment showed an increase of Na(+) concentration within the fresh water of nearly 300% as compared to the concentration given by the first treatment. It was found in the second treatment that in thin aquifers, appreciable quantities of Na(+) could occur in the fresh water in short time periods. In one hypothetical case treated in this study, the concentration of Na(+) in the fresh water reached 600 mg/liter after only 200 days.
W77-08811

ATMOSPHERIC SULFATE ADDITIONS AND CATION LEACHING IN A DOUGLAS FIR ECOSYSTEM,
Washington Univ., Seattle. Coll. of Forest Resources.
D. W. Cole, and D. W. Johnson.
Water Resources Research, Vol. 13, No. 2, p 313-317, April 1977. 5 fig, 2 tab, 16 ref.

Descriptors: *Precipitation(Atmospheric), *Chemistry of precipitation, *Acidic water, *Leaching, Forests, Douglas fir trees, Soils, Soil horizons, Soil water, Cations, Anions, Chemistry, Rainfall, Sulfates, Hydrogen ion concentration, Conductivity, Acids, Ecosystems.

Precipitation sulfuric acid input was small in comparison to sulfate and cation transfers within the ecosystem studies. Most of the annual incoming hydrogen ions were removed in the forest canopy, presumably through an exchange process. Therefore, canopy leaching appears to be most strongly affected by acid rainfall, whereas soil leaching appears to be dominated by mechanisms internal to the ecosystem, such as carbonic acid leaching and sulfur release from decomposing litter. (Sims-ISWS)
W77-08822

SOME HYDROCHEMICAL CHARACTERISTICS OF THE MOUTH REACHES OF THE ANABAR, LENA, YANA, AND INDIGIRKA RIVERS,
For primary bibliographic entry see Field 2L.
W77-08833

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W77-08854

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
N. K. Val'chuk, and I. N. Chipik.
Gig Sanit. 4, p 97-98, 1974.

Descriptors: *Molybdenum, Subsurface waters, *Artesian wells, Water wells, Water analysis, Water chemistry.
Identifiers: Artesoam, *USSR(Vinnitsa Oblast).

Artesian wells (343) in the Vinnitsa district (Ukrainian SSR, USSR) were analyzed with respect to the Mo content in subsurface waters. The Mo content in the well water varied considerably both within each region and in the district as a whole. An analysis of the Mo content in crops as a function of the soil-climatic zones established that the maximum content is found in products from regions of the southern forest-steppe soil-climatic zone, where the maximum content was also found in the water. No correlation was found between the Mo level in the environment and the incidence of goiter among the population.--Copyright 1975, Biological Abstracts, Inc.
W77-08882

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W77-08944

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
A. H. Johnson, and R. C. Reynolds, Jr.
Water Resources Research, Vol 13, No 2, p 469-473, April 1977. 3 fig, 3 tab, 12 ref.

Descriptors: *Streams, *Chemical properties, *Water chemistry, *Water quality, *Vermont, *New Hampshire, Watersheds(Basins), Chemistry, Dissolved solids, Chemical analysis, Chemistry of precipitation, Hydrogen ion concentration, Calcium, Magnesium, Sodium, Potassium, Analytical techniques.
Identifiers: *Headwater streams, *Dissolved constituents, Bedrock types, Green Mountains, White Mountains, Plutonic rocks, Solute content.

Streamwater samples were collected from headwater streams in Vermont and New Hampshire during low-flow periods in the fall. Then the samples were analyzed for principal dissolved constituents. Dissolved solids are qualitatively and quantitatively related to bedrock type. Streams draining watersheds underlain by plutonic bedrock are acid, mixed cation sulfate waters with little buffering capacity and very low solute content (about 16 mg/l). Streams draining metamorphic and sedimentary terrains are characterized by neutral pH, alkaline earth cations, and mixed anions or bicarbonate. Concentrations of Ca + Mg + Na + K and pH of streams draining granitic bedrock are lower than those of streams draining similar rock types in small watersheds in the Sierra Nevada and Sangre de Cristo mountains. (Henley-ISWS)
W77-09027

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
For primary bibliographic entry see Field 5B.
W77-09054

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
G. M. McMurtry, P. F. Fan, and T. B. Coplen.
American Journal of Science, Vol 277, No 4, p 438-458, April 1977. 7 fig, 3 tab, 41 ref.

Descriptors: *Geothermal studies, *Hawaii, *Chemical analysis, *Temperature, *Groundwater, Wells, Springs, Precipitation(Atmospheric), Steam, Geophysics, Volcanoes, Evaluation, Isotope studies, Stable isotopes.

The chemical and isotopic compositions of Hawaiian groundwater were studied to locate and evaluate potential geothermal areas. Analyses were made of forty-three samples from twenty-seven wells, two coastal springs, local precipitation, and stream. Three methods of chemical geothermometry were applied: (1) silica, (2) Na-K-Ca, and (3) stable isotope or deuterium-oxygen-18. Based on the silica and stable isotope methods, the most promising geothermal areas are the summit of Kilauea Volcano and the area near geothermal test hole 3 in the Puna district (east rift zone of Kilauea Volcano). There, temperatures calculated from dissolved silica range from about 160 degrees to 275 degrees C. Mixing with cooler groundwaters appears to be a significant feature of these geothermal reservoirs. Seawater intrusion, possibly due to thermal disruption of the equilibrium of the Ghyben-Herzberg lens in geothermal areas, tends to interfere with the geothermometry of the Na-K-Ca and stable isotope methods. (Woodard-USGS)
W77-09082

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.

For primary bibliographic entry see Field 2L.
W77-09089

2L. Estuaries

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5D.
W77-08634

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08681

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
For primary bibliographic entry see Field 5C.
W77-08692

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-08697

THE BEHAVIOUR OF DISSOLVED IRON, MANGANESE AND ZINC IN THE BEAULIEU ESTUARY, S. ENGLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 5B.
W77-08701

EFFECTS OF MERCURY, CADMIUM, AND LEAD SALTS ON REGENERATION AND ECDYSIS IN THE FIDDLER CRAB, UCA PUGILATOR,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
For primary bibliographic entry see Field 5C.
W77-08702

THE DISTRIBUTION OF TRACE METALS IN THE WESTERN NORTH ATLANTIC OFF NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
For primary bibliographic entry see Field 5B.
W77-08703

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-08704

EFFECTS OF A SPILL OF MARINE DIESEL OIL ON THE MEIOFAUNA OF A SANDY BEACH AT PICNIC BAY, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08760

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08762

METHOD FOR DETERMINING ACUTE TOXICITY OF AN ACID WASTE AND LIMITING PERMISSIBLE CONCENTRATION AT BOUNDARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltham, Mass.
For primary bibliographic entry see Field 5C.
W77-08771

EUTROPHICATION OF AN IMPOUNDED ESTUARINE LAGOON,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08778

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W77-08781

CONCENTRATIONS OF PCBS, DIELDRIN AND DDT RESIDUES IN MARINE ANIMALS FROM LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08788

SOME EFFECTS OF OIL DISPERSANTS ON THE FEEDING BEHAVIOUR OF THE BROWN SHRIMP, CRANGON CRANGON,
Southampton Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08790

ECOLOGY OF TOXICITY IN MARINE SPONGES,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
For primary bibliographic entry see Field 5C.
W77-08793

EFFECT OF THE WATER-SOLUBLE FRACTIONS OF CRUDE, REFINED AND WASTE OILS ON THE EMBRYONIC AND LARVAL STAGES OF THE QUAHOG CLAM MERCENARIA SP.,
Florida State Univ., Tallahassee. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08794

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5A.
W77-08795

THE EFFECT OF WARM EFFLUENT FROM THE NOVOROSSIYSK THERMAL POWER PLAN ON ZOOPLANKTON,
Kuban State Univ., Novorossisk (USSR). Marine Biology Research Station.
For primary bibliographic entry see Field 5C.
W77-08804

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
B. W. Turner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 896, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, August 1975. 93 p, 15 fig, 9 tab, 41 ref. OWRT A-043-HI(1). 14-31-0001-4011, 14-31-0001-5011 (Part.).

Descriptors: *Sediment deposits, *Anaerobic conditions, *Montmorillonite, *Metals, *Hawaii, Harbors, Distribution, Mineralogy, Chromium, Nickel, Iron, Lead, Zinc, Copper, Water pollution sources.
Identifiers: Estuarine stratification, *Stratified water column, Forminifera, Pearl Harbor(Hawaii), *Mineral distribution.

Some of the metal concentrations reported for areas in Pearl Harbor, Hawaii may be the result of natural processes, i.e., chromium and nickel in relation to the basaltic mineral suite, and iron, zinc, lead, and copper to the distribution of anaerobic bottom conditions. Such conditions would probably occur in the Harbor in its natural state, although they are greatly enhanced by man's activity and large contribution of organic detritus. Montmorillonite is found in greatest abundance in the southeast Loch area near the bentonitic Salt Lake tuff; its general distribution throughout the Harbor is governed by proximity to highly montmorillonitic soils and tuffs and the degree of vertical mixing within the stratified water column. The distribution of authigenic pyrite in the Harbor is related to the depth to the anaerobic layer and to the distribution of organic matter. Estuarine stratification is pronounced in West and Middle Lochs, and the stability of the water column combined with the high influx of organic matter renders the bottom layer anoxic. In West Loch the production of H2S in the sediments may restrict the habitat of foraminifera to the shallow (probably the upper 5 m) periphery of the Loch; the character of the foraminiferal population fluctuates greatly with the volume of fresh water influx and the effects of prevailing winds on the brackish layer. Coral fragments and clayey carbonaceous sediments indicate dredge spoils.
W77-08815

EFFECT OF THE BOUNDARY SURFACE BETWEEN SEA AND FRESH WATERS ON THE DISTRIBUTION OF DISSOLVED OXYGEN IN THE MOUTH REGION OF THE DNIEPER RIVER,
For primary bibliographic entry see Field 5B.
W77-08832

SOME HYDROCHEMICAL CHARACTERISTICS OF THE MOUTH REACHES OF THE ANABAR, LENA, YANA, AND INDIGIRKA RIVERS,
A. N. Zubakina.
Soviet Hydrology, Selected Papers, No. 4, p 229-233, 1975. 2 fig, 1 tab, 12 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No. 118, p 44-55, 1974.

Descriptors: *Estuaries, *Rivers, *Water chemistry, *Arctic, Ions, Cations, Chlorides, Carbonates, Sulfates, Foreign countries, Foreign research, Phosphates, Silicates, Mineral waters, Chemistry, On-site investigations.
Identifiers: *USSR, *Yakutia(USSR).

In recent years, many industrial organizations of the Yakut USSR, primarily the fishing industry, have shown interest in the water chemistry of the mouth reaches of rivers in northern Yakutia. An attempt was made to describe some aspects of the hydrochemical regime in the mouths of rivers (Anabar, the Bykovskiy arm of the Lena, Yana, Indigirka), which have not as yet been described in the literature because of the lack of necessary observational data. The observations were confined to the main phases of the hydrologic regime of the rivers, which, undoubtedly, could not reflect completely the effect of the sea on the hydrochemical regime of the river mouths. (Sims-ISWS)
W77-08833

ROLE OF RIVER RUNOFF AND OF WATER EXCHANGE IN THE SALINITY OF THE NORTHERN CASPIAN SEA,
For primary bibliographic entry see Field 2H.
W77-08836

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08837

SURFACE PARTICLE ORBITS IN UNIFORM WAVES,
Liverpool Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08845

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
F. P. Shepard, P. A. McLoughlin, N. F. Marshall, and G. G. Sullivan.
Geology, Vol 5, No 5, p 297-301, May 1977. 6 fig, 9 ref. NSF DES74-22089, ONR N00014-69-A-0200-6049.

Descriptors: *Currents(Water), *Ocean currents, *Turbidity currents, *Submarine Canyons, Coasts, *Current meters, Tides, Canyons, Sediment transport, Flow, Turbidity, Oceanography, Sediments.

Turbidity currents of high velocity may occur during catastrophic conditions, but records suggest that currents of little more than 1 knot (= 0.5 m/s) may be quite common in submarine canyons. Three current-meter records of such currents were obtained (1) during an onshore storm at La Jolla, California, (2) during relatively high swells off the Rio Balsas Delta in western Mexico, and (3) in Abra Canyon off the Abra Delta in northwest Luzon during flood conditions. A pattern observed in all these occurrences included a preceding, relatively large, upcanyon flow, a rapid buildup of the downcanyon turbidity current, a slow decay, and a following interval of no current. The currents may be particularly common where deltas have built across the continental shelf and where large masses of sediment are being introduced into canyon heads. The relatively weak currents may transport large quantities of sediment down the canyon. (Sims-ISWS)
W77-08847

GRAIN-SIZE PARAMETERS OF INSOLUBLE RESIDUES IN MIXXED TERRIGENOUS-SKELETAL CARBONATE SEDIMENTS AND SEDIMENTARY ROCKS: SOME NEW ZEALAND EXAMPLES,
Waikato Univ., Hamilton (New Zealand). Dept. of Earth Sciences.
C. S. Nelson.
Sedimentology, Vol 24, No 1, p 31-52, February 1977. 14 fig, 1 tab, 27 ref.

Descriptors: *Particle size, *Beaches, *Deposition(Sediments), Environment, Sieve analysis, Sediment distribution, Geologic investigations, Carbonates, Sediment transport, Sediment sorting, Histograms, On-site investigations, Foreign countries, Foreign research.
Identifiers: *Terrigenous-skeletal sediments, *New Zealand, Depositional processes.

Grain-size parameters derived from the mechanical analysis of acid-insoluble residues from mixed terrigenous-shell beach sediments from Auckland, New Zealand, are more effective for interpreting the depositional processes and for characterizing the beach environment on textural scatter plots than are parameters based on the analysis of the total beach samples. This results mainly from the wide variations in size of hydraulically equivalent skeletal carbonate grains in the sediment, especially in the coarser size grades, but may also be accentuated by the local origin and by susceptibility to alteration of the shell material. Compared with the total sediment grain-size distribution, the insoluble residues from the beach deposits are characteristically finer-grained, better sorted, and more consistently coarse-skewed and leptokurtic. The grain-size distribution characteristics of insoluble residues from several stratigraphic units in a sequence of Oligocene mixed terrigenous-skeletal shelf sediments in the South Auckland region distinguish depositional mechanisms and environmental energy levels for each unit that are consistent with interpretations made on the basis of carbonate petrography and palaentology. With regard to the bulk content of terrigenous mud in the insoluble residues, the grain-size distribution of the fraction coarser than 4 phi is alone diagnostic of the energy-time trends in these sediments. (Visocky-ISWS)
W77-08848

OCEANOGRAPHIC FEATURES, CURRENTS, AND TRANSPORT IN CABOT STRAIT,
Quebec Univ., Rimouski. Dept. of Oceanography.
M. I. El-Sabh.
Journal of the Fisheries Research Board of Canada, Vol 34, No 4, p 516-528, April 1977. 13 fig, 3 tab, 38 ref.

Descriptors: *Straits, *Estuaries, *Currents(Water), *Canada, *St Lawrence River, Flow, Water temperature, Salinity, Variability, Runoff, Surface runoff, Rivers, On-site investigations, Model studies, Mathematical models, Oceanography.
Identifiers: *Cabot Strait(Canada).

Seventy oceanographic sections across Cabot Strait, taken at various times of the year between 1950 and 1974, were utilized to describe the average oceanographic features, currents, and volume transport patterns as well as their variations with depth and time. The water mass structure in Cabot Strait is a two-layered structure; the water in the upper 50-100 m typically is moving seaward, while below that depth it is commonly found to be moving into the Gulf. The character of the upper layer which is normally not of uniform thickness across the Strait, but is distinctly wedge-shaped, is subject to considerable seasonal variation, whereas that of the lower is quite uniform the year round. Seasonal and long-term variations of the physical properties in Cabot Strait were described. Outflow through Cabot Strait was shown to be concentrated in the upper layer off Cape Breton and is balanced by inflow at intermediate depths on the Newfoundland side and in the deep portions of the section. The maximum and minimum transports, both inflow and outflow, occur in August and June, respectively. The net outward volume transport through the Strait increases from 9000 cu m/s in April to 2500 cu m/s in August and decreases to about 100 cu m/s in February. The weighted mean value, 13000 cu m/s agrees well with the value obtained from an estimate of net freshwater input rate (run-off plus precipitation minus evaporation) above the section. The maximum transport occurs at times of surface minimum salinity. Horizontal advective transport of salt was found to be more important than horizontal diffusive transport. Recommendations for future transport studies in Cabot Strait were presented. (Sims-ISWS)
W77-08851

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-08852

COMPREHENSIVE OCEANOGRAPHIC BASELINE STUDY AT BARCELONETA, PUERTO RICO.
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 5B.
W77-08853

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
E. T. C. Spooner, and C. J. Bray.
Nature, Vol 266, No 5605, p 808-812, April 28, 1977. 4 fig, 1 tab, 41 ref.

Descriptors: *Hydrothermal studies, *Mineralogy, *Sulfides, *Sea water, Pyrite, Freezing, Salinity, Copper, Convection, Metamorphic rocks, Microscopy, Economic impact.
Identifiers: *Ore deposits, *Cyprus, *Metal transport, Freezing points, Oceanic crust layer 2, Fluid inclusions, Thin sections.

Freezing points of fluid inclusions in vein quartz intergrown with sulphides from ophiolitic cupriferous pyrite ore deposits in Cyprus indicate a hydrothermal fluid of seawater salinity and confirm the hypothesis of metal transport in hot seawater. Therefore, it was suggested that the economic potential of oceanic crust layer 2 is probably neligible. (Visocky-ISWS)
W77-08854

SINKAGE AND RESISTANCE FOR SHIPS IN CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08873

MEANS AND METHOD FOR CONTROLLING BEACH AND SANDBAR EROSION,
For primary bibliographic entry see Field 8B.
W77-08894

WAVE HEIGHT MEASURING DEVICE,
Texaco Inc., New York.
For primary bibliographic entry see Field 7B.
W77-08897

HIGH SENSITIVITY FLOWMETER,
Office of the Secretary (Navy), Washington, D.C.
For primary bibliographic entry see Field 7B.
W77-08898

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-08900

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-08901

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-08902

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
G. C. Thomann.
Available from the National Technical Information Service, Springfield, VA 22161 as N76-22634, Price codes: A03 in paper copy, A01 in microfiche. Report No. 118, January 1975. 37 p, 11 fig, 8 tab, 4 ref.

Descriptors: *Salinity, *Remote sensing, *Estuarine environment, *Resources development, Baseline studies, Environmental effects, Estuaries, Mississippi.
Identifiers: *Outer Continental Shelf, *Mississippi Coast.

An aircraft experiment was flown on November 7, 1973 to test a technique (Thomann, 1973) for remote water salinity measurement. Apparent temperatures at 21 cm and 8-14 micro m wave lengths were recorded on eight runs over a line along which the salinity varied from 5 to 30 o/oo. Boat measurements were used for calibration and accuracy calculations. Overall RMS accuracy over the complete range of salinities was 3.6 o/oo. Overall RMS accuracy for salinities greater than o/oo, where the techniques is more sensitive, was 2.6 o/oo. Much of this error is believed to be due to in ability to exactly locate boat and aircraft positions. The standard deviation over the eight runs for salinities approximately 10 o/oo is 1.4 o/oo; this error contains a component due to mislocation of the aircraft also. It is believed that operational use of the technique is possible with accuracies of 1-2 o/oo under conditions specified in the paper. (Sinha-OEIS)
W77-08903

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W77-08905

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-08907

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
E. D. Seneca, W. W. Woodhouse, Jr., and S. W. Broome.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-023 178, Price codes: A03 in paper copy, A01 in microfiche. U.S. Army Coastal Engineering Research Center Miscellaneous Report NO 76-3, February 1976. 43 p, 16 fig, 13 tab, 8 ref. DACW72-73-C-0025.

Descriptors: *Stabilization, *Dunes, *North Carolina, Coasts.
Identifiers: *Panicum amarum, Bitter panicum, Ammophila breviligulata, American beachgrass, Dune building, Resources management, *Dune stabilization.

Dune stabilizing and dune building potential of Panicum amarum (bitter panicum) along the North Carolina coast was studied. A nursery was established with transplants collected from two coastal locations to provide transplants for field experiments. Techniques for propagation, handling, processing, and planting bitter panicum for use in coastal areas were determined. Experimental plantings with emphasis on bitter panicum together with Ammophila breviligulata (American beachgrass) and Uniola paniculata (sea oats) were made at two coastal locations. On a sandy site about 300 meters inland where there was relatively little sand moving, bitter panicum contributed more of the estimated cover through two growing seasons than either of the other two grasses. Over a 24-month period at a foredune site, bitter panicum accumulated about one-fourth the sand accumulated by either three selections of American beachgrass or mixed species plantings involving all three grasses. Results indicate that the principal values of bitter panicum are in stabilizing sandy coastal areas and in mixed species plantings to build and stabilize coastal foredunes in the southeastern United States. (Sinha-OEIS)
W77-08908

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
L. R. Poole.
National Aeronautics and Space Administration, Technical Note NASA TN D-8353, December 1976. 43 p, 10 fig, 12 ref.

Descriptors: *Remote sensing, *Continental shelf, *Computer models, *Refraction(Water waves), Geophysics, Shoals, Energy.
Identifiers: *Wave spectra, Wave refraction, Mid-Atlantic Ocean.

An initial attempt was made to verify the Langley Research Center and Virginia Institute of Marine Science mid-Atlantic continental-shelf wave refraction model. The model was used to simulate refraction occurring during a continental-shelf remote sensing experiment conducted on August 17, 1973. Simulated wave spectra compared favorably, in a qualitative sense, with the experimental spectra. However, it was observed that most of the wave energy resided at frequencies higher than those for which refraction and shoaling effects were predicted. In addition, variations among the experimental spectra were so small that they were not considered statistically significant. In order to verify the refraction model, simulation must be performed in conjunction with a set of significantly varying spectra in which a considerable portion of the total energy resides at frequencies for which refraction and shoaling effects are likely. (Sinha-OEIS)
W77-08911

WAVE REFRACTION DIAGRAMS FOR THE BALTIMORE CANYON REGION OF THE MID-ATLANTIC CONTINENTAL SHELF COMPUTED BY USING THREE BOTTOM TOPOGRAPHY APPROXIMATION TECHNIQUES,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
L. R. Poole.
National Aeronautics and Space Administration, Technical Memorandum NASA TM X-3423, December 1976. 155 p, 52 fig, 1 tab, 4 ref.

Descriptors: *Continental Shelf, *Computer models, *Refraction(Water waves), *Submarine canyons.
Identifiers: *Outer Continental Shelf, *Wave refraction, Mid-Atlantic, Oceanographic data, *Baltimore Canyon, Bottom topography.

The Langley Research Center and Virginia Institute of Marine Science wave refraction computer model was applied to the Baltimore Canyon region of the mid-Atlantic continental shelf. Wave refraction diagrams for a wide range of normally expected wave periods and directions were computed by using three bottom topography approximation techniques: quadratic least squares, cubic least squares, and constrained bicubic interpolation. Mathematical or physical interpretation of certain features appearing in the computed diagrams is discussed. (Sinha-OEIS)
W77-08912

HARBOR AND NEARSHORE CURRENTS, OSWEGO HARBOR, NEW YORK,
National Oceanic and Atmospheric Administration, Ann Arbor, Mich.
G. S. Miller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 651, Price codes: A03 in paper copy, A01 in microfiche. NOAA Technical Report No ERL 360-GLERL 7, January 1976. 32 p, 19 fig, 14 ref. Also as GLERL Contribution No 59.

Descriptors: *New York, *Currents(Water waves), *Cooling water, Harbors, Lake Ontario, Powerplants, Water temperature.
Identifiers: *Nearshore currents, *Seasonal variation, *Wind stress, *Oswego Harbor(NY).

The results of a study to determine current patterns in the harbor and adjacent nearshore area and to relate these patterns to main generating forces is presented. The results of this report and several other coastal investigations conducted in the Oswego area indicate persistant eastward flowing baroclinic coastal currents. It has been observed that wind stress transports warm Lake Ontario surface water toward the south shore, thereby resulting in strong baroclinic coastal currents toward the east. Airborne thermal mapping of the harbor area indicates that the outflow of warm river water and power-plant cooling effluent from the harbor affects the water temperature and nearshore flow patterns out to more than 4 kilometers in the lake and that the higher temperature water is evident through all seasons. Dynamic height analysis also indicates a northward bulge at Oswego. (Sinha-OEIS)
W77-08913

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF GEORGIA,
National Weather Service, Silver Spring, Md. Office of Hydrology.
F. P. Ho.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-7411746, Price codes: A03 in paper copy, A01 in microfiche. NOAA Technical Memorandum NWS HYDRO-19, September 1974. 31 p, 8 fig, 4 tab, 15 ref.

Descriptors: *Tides, *Georgia, *Floods, *Land use, Storms, Frequency analysis, Hurricanes, Coasts, Insurance, *Flood plain insurance.
Identifiers: *Storm tides.

Storm tide height frequency distributions are developed on the Georgia coast for the National Flood Insurance Program by computing storm tides from a full set of climatologically representative hurricanes, using the National Weather Service hydrodynamic storm surge model. Tide levels are shown in coastal profile between annual frequencies of 0.10 to 0.002. This report is intended for use in estimating actuarial risk to buildings from coastal floods and in land use management. (Sinha-OEIS)
W77-08914

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
R. A. Diener.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 511, Price codes: A07 in paper copy, A01 in microfiche. NOAA Technical Report NMFS CIRC-393, September 1975. 136 p, 55 fig, 26 tab, 52 ref.

Descriptors: *Estuaries, *Baseline studies, *Water pollution, *Environmental effects, *Texas, *Gulf of Mexico, Shellfish, Waste disposal.
Identifiers: Outer Continental Shelf, Resource availability, Inventory.

Seven Texas estuarine areas are described in terms of their dimensions; major vegetation types; geology and geological history, drainage basins and stream discharge records; hydrological, biological, and benthic properties; populations and economic development; pollution; and navigation projects. These areas include the Sabine Lake, Galveston Bay, Matagorda Bay-Brazos River Delta, San Antonio Bay, Copano-Aransas Bay, Corpus Christi Bay, and the Laguna Madre. A list of pertinent literature is also presented. The Texas coast is important for its sport and commercial fisheries and for waterfowl hunting. Pollution from domestic and industrial sources has forced the closing of about 325,090 acres of open bay waters to shellfishing and an additional 16,600 acres closed on a conditional basis. Over 1,050 miles of Federal navigation channels are situated on the Texas coast, the most important of which is the Gulf Intracoastal Waterway, which extends from the Sabine River to Brownsville. Large areas of open estuarine waters, especially in the Sabine Lake and Galveston Bay areas, have been displaced by large spoil areas. (Sinha - OEIS)
W77-08916

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08918

KINETIC RESPONSE OF PERTURBED MARINE NITRIFICATION SYSTEMS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 5C.
W77-08946

FLORIDA'S SOVEREIGNTY SUBMERGED LANDS: WHAT ARE THEY, WHO OWNS THEM AND WHERE IS THE BOUNDARY,
For primary bibliographic entry see Field 6E.
W77-08951

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

LEGAL BATTLES ON THE CALIFORNIA COAST: A REVIEW OF THE RULES,
National Oceanic and Atmospheric Administration, Washington, D. C. Office of Sea Grant.
For primary bibliographic entry see Field 6E.
W77-08963

A RATIONAL NATIONAL POLICY ON PUBLIC USE OF THE BEACHES,
House, Washington, D.C.
For primary bibliographic entry see Field 6E.
W77-08976

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
P. D. Komar.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12916, p 225-239, May 1977. 6 fig, 18 ref, 1 append.

Descriptors: *Beaches, *Sands, *Sediment transport, Coastal engineering, Laboratory tests, Littoral drift, Scaling, Surf, Oceans.
Identifiers: Scale effect, Wave energy, Wave tanks, Longshore sand transport.

Considerable data were collected in laboratory wave basins in an attempt to relate the sand transport rate to the wave conditions. The study undertook a review of laboratory data in an attempt to determine if any scaling laws can account for the scatter, laws which might indicate how the transport rate is a function of grain size and density. No such systematic laws were found; the laboratory data did not even demonstrate a relationship between the sand transport rate and the settling velocity of the beach sediment. Solutions were developed for the distribution of longshore sand transport across the beach width. One solution ignores the stress due to the longshore currents, including only the stress of the waves; a more complicated solution includes both stress contributors. In both cases, the distributions were made to yield the correct total and transport rate, according to the field data, when the distributions are integrated across the surf zone width. (Lee-ISWS)
W77-09019

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
R. J. Seymour.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12924, p 251-264, May 1977. 10 fig, 3 tab, 19 ref, 1 append.

Descriptors: *Coastal engineering, *Fetch, *Model studies, Lakes, Waves(Water), Winds, Bays, Water, Equations, Measurement.
Identifiers: *Wave energy, *Wave forecasting, Wave generation, Wave spectrum, Restricted fetches, Measured spectra, Limited fetches.

The applicability of one-dimensional wave generation models to fetches that are restricted in width as well as length was considered. An analytical estimation approach, the spectral contribution method, was developed and compared with measured results from four sites with varying degrees of fetch restriction. For width restricted fetches, the spectral contribution method was a more efficient estimator than the effective fetch method. Two one-dimensional wave generation models and two directional distribution models were investigated. For limited fetches, the JONSWAP spectrum appeared to be slightly superior to the Bretschneider spectrum; and the Pierson, Neumann, and James distribution yielded better estimates than the Longuet-Higgins, Cartwright, and Smith distribution. (Roberts-ISWS)
W77-09021

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
T. J. Weare.
Journal of Hydraulics Research, Vol. 15, No. 1, p 55-72, 1977. 11 fig, 5 ref.

Descriptors: *Reclamation, *Estuary, *Model studies, *Numerical analysis, *Currents(Water), Hydraulic engineering, Momentum equation, Coriolis force, Turbulence, Sediment transport.
Identifiers: *Thames Estuary.

The proposal to construct an airport and a seaport on the reclaimed land in the Thames Estuary raised questions about the effects of reclamation on the hydraulics of the estuary. A large physical model was built to assess the local effects due to reclamation, to test the various design shapes of the reclamation, and to identify suitable borrow areas for the large quantities of fill material required. In addition to the physical model, a numerical model study was carried out, the principal function of which was to fill a supporting role complementary to that of the physical model. The physical model was found to be critically sensitive to the current generator controls. Some processes such as Coriolis force, sediment transport, surface wind, changing friction due to changing bed forms, and diffusion, which cannot be easily modeled and varied in a physical model, can be included in a numerical model. This is the complementary supporting role for such models. It is reasonable to expect that an increasing proportion of hydraulic investigations will be undertaken by numerical techniques as computing sources continue to develop. (Singh-ISWS)
W77-09037

A RECONNAISSANCE OF THE HYDROLOGY OF THE EDISTO AND ASHEPOO ESTUARIES, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
F. A. Johnson.
South Carolina Water Resources Commission, Columbia, Report No 6, 1976. 53 p, 13 fig, 10 tab, 16 ref.

Descriptors: *Tidal effects, *Estuaries, *South Carolina, *Saline water intrusion, *Saline water-freshwater interfaces, Water quality, Stratification, Mixing, Low flow.
Identifiers: *Edisto estuary(SC), *Ashepoo estuary(SC).

A reconnaissance study has been made to provide background information on some of the physical and chemical characteristics of the Edisto and Ashepoo estuaries in South Carolina. Data were collected from the estuaries on the physical dimensions, tidal stages, saltwater intrusion at high and low tides, and water-quality above the saltwater intrusion. The times of the high and low tides at the upper ends of the estuaries lag those at the lower end by several hours. Tidal range is reduced at the upper ends by about 70 percent. During

average freshwater inflow conditions, the interface between freshwater and saltwater penetrates the Edisto estuary to mile 19.5 and the Ashepoo estuary to mile 24 at high tide. During periods of very low freshwater inflow, such as the 7-day 10-year low flow, the interface at high tide might penetrate to mile 32 (near Jacksonboro) on the Edisto River. During a similar low-flow period, the Ashepoo River would be brackish or salty to about mile 38. Above the saltwater interface, the water of both estuaries is of good quality and suitable for most uses if treated for iron and color. The bed sediments throughout the study area, with the exception of iron, have little or no indications of heavy metals, herbicides or pesticides. (Woodard-USGS)
W77-09076

A RECONNAISSANCE OF THE HYDROLOGY OF THE INTRACOASTAL WATERWAY FROM BUCKSPORT TO LITTLE RIVER INLET, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
F. A. Johnson.
South Carolina Water Resources Commission, Columbia, Report No 7, 1977. 33 p, 7 fig, 7 tab, 8 ref.

Descriptors: *Saline water-freshwater interfaces, *Navigable waters, *Coasts, *South Carolina, Canals, Inflow, Rivers, Tidal effects, Tidal streams, Estuaries, Salinity, Travel time, Tracers, Dye releases, Saline water intrusion, Stratification, Water quality, Evaluation, Water utilization.
Identifiers: *Intracoastal Waterway(SC).

Some of the physical and chemical characteristics of the Intracoastal Waterway (ICWW) between Bucksport and Little River Inlet, South Carolina, have been related to tidal conditions and freshwater inflow; also the suitability of the water for use has been considered. Dye tracing techniques have been used to determine the time-of-travel from mile 375 where the Waccamaw River enters the ICWW to Little River Inlet below mile 342. Fresh surface-water flow is contributed only by one major tributary, the Waccamaw River, which divides at mile 375, with two-thirds flowing southward. The one-third that flows northward takes about 6 days to reach Little River Inlet. The position of the saltwater interface at high tide in the ICWW is largely controlled by the portion of the Waccamaw River flow that goes northward and is itself probably governed by the amount of backwater caused by the Pee Dee River through Bull Creek. The interface at high-slack tide changes position by only a few miles between low and high freshwater inflow, usually remaining within 6 to 10 miles of Little River Inlet. The water above the interface is of good quality and suitable for most uses. (Woodard-USGS)
W77-09077

PRELIMINARY SUMMARY OF THE 1976 ATLANTIC MARGIN CORING PROJECT OF THE U.S. GEOLOGICAL SURVEY,
Geological Survey, Reston, Va. Water Resources Div.; and Geological Survey, Reston, Va. Geologic Div.
J. C. Hathaway, J. S. Schlee, C. W. Poag, P. C. Valentine, and E. G. A. Weed.
Open-file report 76-844, November 1976. 217 p, 4 append.

Descriptors: *Core drilling, *Core logging, *Continental shelf, *Atlantic Ocean, *United States, Coasts, Petrology, Offshore platforms, Sedimentology, Freshwater, Salinity, Aquifers, Stratigraphy, Chemical analysis, Environment.

The U.S. Geological Survey Atlantic Margin Coring Project, 1976, a 60-day expedition to obtain core samples by drilling beneath the floor of the Continental Shelf and Slope of the eastern United States, was carried out in July, August, and September 1976 aboard D/V GLOMAR CONCEPTION. The coring penetrated as much as 310 meters below the sea floor at 19 sites along the continental margin from Georgia to Georges Bank off New England in water depths ranging from 20 to 300 meters; 1,020 meters of material were recovered in 380 cores, ranging in age from Late Cretaceous to Holocene. One of the major findings was the discovery of relatively fresh water (salinities less than 3 parts per thousand) extending beneath the Continental Shelf as much as 60 nautical miles seaward from the New Jersey coast. Water of about 1 part per thousand salinity was found beneath the shelf more than 7 nautical miles off Ocean City, Maryland and Barnegat Inlet, New Jersey. Analyses for light hydrocarbons in the cores show the highest concentrations (as much as 412,000 ppm) at sites in water depth greater than 200 meters (the shelf-slope break), principally in Pleistocene sediments, although methane concentrations greater than 400,000 ppm also were found in Miocene sediments at one site near the shelf edge. (Woodard-USGS)
W77-09089

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

NEW DIRECTIONS IN ION EXCHANGE,
Water Purification Associated, Cambridge, Mass.
For primary bibliographic entry see Field 5D.
W77-08719

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

3B. Water Yield Improvement

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
R. K. Frobel, C. B. Cluff, and R. A. Jimenez.
Available from the National Technical Information Service Springfield VA as PB-268 779, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, June 1977, 50 p, 17 fig, 8 tab, 13 ref, 2 append. OWRT A-075-ARIZ(2), 14-34-0001-7006.

Descriptors: *Seepage control, Water harvesting, *Asphalt, *Rubber, Water conservation, Testing, Absorption, Viscosity, *Reservoir leakage.
Identifiers: Waterproof membranes, *Asphalt rubber membranes.

This project was concerned with the laboratory and field investigation of asphalt-rubber for use in water seepage control applications. Laboratory testing utilized for physical property determination included viscosity, ductility (ASTM D113-74), flow/slope stability, brittleness/impact resitance (ASTM D994-72), water vapor transmission (ASTM E96-72, Procedue BW), water absorption (ASTM 570-72)l, and permeability. Also, some specialized laboratory equipment was desinged and fabricated for the testing. The results of the testing showed that the asphalt-rubber is relatively impermeable as a membrane, and that the rubber does not effect an otherwide impermeable asphalt film. Physical properties of the base asphalt that are increased with the addition of rubber include water absorption, viscosity, and impact resistance. The tests that exhibited lower physical property values were ductility and slope stability. Investigations of field appliations of asphalt-rubber resulted in preliminary subgrade preparation specifications. Also, the field installations supported the hypothesis that the asphalt-rubber can be effectively used as a water seepage barrier. Preliminary specifications for asphalt-rubber mixing and field appliation are also included.
W77-08601

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4C.
W77-08712

EVAPORATION FROM SEVEN RESERVOIRS IN THE DENVER WATER-SUPPLY SYSTEM, CENTRAL COLORADO,
Geological Survey, Reston, Va. Water Resource Div.; and Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 2D.
W77-08736

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

SOIL AND ROCK STRATA TO TRAP, FILTER AND STORE WATER FOR RURAL DOMESTIC USE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
A. T. Corey, and G. L. Smith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 820, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Dec. 1976. 36 p, 22 fig, 1 tab, 4 ref. OWRT C-6176(No. 5219)(1).

Descriptors: *Aquifers, Aquifer testing, Arid lands, *Artificial recharge, Artificial use, Bank storage, Channel beds, Design criteria, *Domestic water, Freshwater, *Groundwater, Overland flow, Percolation, Pervious soils, Potable water, Rainfall, Runoff, Sands, Soil moisture, *Soil physics, Terrain, Springs, *Indian reservations, Water storage, New Mexico, South Dakota, Water supply.

Experimental rock and soil strata for collection, filtration and storage of rainfall and runoff water were constructed on three separate Indian Reservations: Ramah Navajo, and Santa Clara Pueblo in New Mexico, and the Pine Ridge (Oglala Sioux) in South Dakota. The artificial spring strata were constructed to determine their potential in the development and use of Indian and other lands located in the arid and semi-arid sections of the country where the availability of adequate water supplies for domestic use, for watering livestock in otherwise suitable grazing areas, and for the production of food crops is either severely limited as surface water, or the groundwater is non-existent, excessively saline, or at very great depths. The principle objective was to provide a reliable source of potable water at a relatively low cost. The most important factors in the concentration of experimental strata were site location, techniques of construction of the facility, selection of strata material and method of placement of impermeable layer.
W77-08821

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.

R. M. Solomon.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 975, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1974. 109 p, 12 fig, 6 tab, 56 ref, 6 append. OWRT A-045-ARIZ(2). 14-31-0001-5003.

Descriptors: Watershed management, *Forest watersheds, Evaluation, *Snowmelt, Runoff, Water yield, Water supply, Forest management, *Arizona, *Water yield improvement, *Snowpacks, *Rainfall-runoff relationships, Small watersheds.
Identifiers: New water supply, Forest management guidelines.

A technique was developed for determining daily values of runoff efficiencies from small watersheds by coupling a computer model that simulated Arizona snowmelt processes with graphical techniques of runoff hydrograph separation. The computer program was a USDA Forest Service model modified to better simulate Arizona conditions. An explanation of modifications and limitations of the model is given, along with equations for estimating some of the model input variables. Seven small watersheds with a total of 14 years of record were used in evaluating changing patterns of runoff efficiencies within a year. Additionally, many physical, biological, and climatic variables were correlated with seasonal runoff efficiencies not only among years and among watersheds, but also within a watershed among years, and among watersheds within a season. Prediction equations were also formulated that could be of use in the identification of high water yielding watersheds.
W77-08933

3C. Use Of Water Of Impaired Quality

DISTRIBUTION OF CORN ROOTS IN SANDY SOIL WITH A DECLINING WATER TABLE,
Agricultural Research Service, Mandan, N.D. Northern Great Plains Research Center.
For primary bibliographic entry see Field 2I.
W77-08676

3D. Conservation In Domestic and Municipal Use

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-08602

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
For primary bibliographic entry see Field 5G.
W77-08645

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN INDIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08806

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 900, Price codes: A07 in paper copy, A01 in microfiche. Proceedings of Conference held on Sept. 3-4, 1975, at Royal Villa, Raleigh, NC. 134 p, Edited by James M. Stewart. OWRT A-999-NC(48), N/A.

Descriptors: *Water conservation, Conservation, Pulp and paper industry, Water utilization, Textiles, *Municipal water, *Industrial wastes, *Water reuse, Water rates, Pricing, Maryland, Pennsylvania, *North Carolina.
Identifiers: Hyattsville(Md), *Residential water, *Water saving devices.

This conference was designed specifically to explore ways of making better use of existing water supplies and reducing the cost of wastewater management through conservation and more efficient practices. Thirteen presentations are included on residential, food processing, pulp and paper, and textile water conservation. Papers also were presented on water saving devices and conservation in suburban Maryland and in Pennsylvania. Innovative approaches to rate-making and rate structures were topics for three presentations.
W77-08820

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
For primary bibliographic entry see Field 6B.
W77-08862

PHILADELPHIA'S WATER SYSTEM AUTOMATION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
For primary bibliographic entry see Field 5F.
W77-08864

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W77-08871

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08939

3E. Conservation In Industry

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
For primary bibliographic entry see Field 5G.
W77-08645

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 4B.
W77-08904

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-09050

AN ENERGY ACCOUNTING EVALUATION OF SEVERAL ALTERNATIVES FOR HYDROPOWER AND GEOTHERMAL DEVELOPMENT,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 6B.
W77-09057

3F. Conservation In Agriculture

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
For primary bibliographic entry see Field 4B.
W77-08660

EFFECT OF WATER DEFICIENCY ON THE GROWTH RATE OF SOME WINTER SOFT WHEAT CULTIVARS, (IN BULGARIAN),
Bulgarian Academy of Sciences, Sadovo. Agricultural Experimental Station.
P. G. Stankova.
Fiziol Rast (Sofia) 2(1), p 13-21, 1976.

Descriptors: *Water requirements, *Wheat, *Growth rates, Plant growth, Root development, Consumptive use, Water loss.
Identifiers: Cell sap, Cultivars, Water stress, Water deficit.

Plants from 3 winter soft wheat cultivars ('Sadovska Ranozreika 3', 'San Pastore' and 'Bezostaya 1') differing considerably in morphological and biological characters were grown in Wagner type pots at soil moisture 65-70 MWC (maximum field water capacity). Water stress was achieved by stopping irrigation at stage IV (the tillering phase) and stage VIII (head formation phase) or organogenesis. The plants were kept at the state of permanent wilting for a period of 4 days. The aim of the study was to observe the changes in cell sap concentration, root system development and growth rate which occur in wheat plants of the 3 cultivars as a result of water stress, to follow up their rate and degree of recovery back to the normal state after water stress discontinued until the end of the vegetation period and to evaluate the reduction in yield inflicted to each cultivar. Water stress during stages IV and VIII of wheat organogenesis resulted in higher leaf cell sap concentration and in considerable reduction of total amount of roots and of growth rate. These deviations were more pronounced in the case of water stress during stage VIII. Recovery to normal condition of the indices was only observed in water stress occurring during stage IV and was best achieved in 'Bezostaya L.' Full compensation was not observed. Following water stress during stage IV of organogenesis 'Bezostaya L' had highest grain number and weight per plant, but following water stress at stage VIII this cultivar preserved only the highest grain weight per plant.--Copyright 1977, Biological Abstracts, Inc.
W77-08716

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1975 TO SPRING 1976,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08732

UNIVERSAL COUPLING FOR MOVABLE IRRIGATION PIPES,
Gifford-Hill and Co., Inc., Dallas, Tex. (Assignee).
J. E. Hansen.
U.S. Patent No. 3,997,192, 9 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, no 2, p 645, December 14, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practices, *Irrigation efficiency, Distribution systems, Flow control, Application equipment.
Identifiers: *Universal couplings.

As tower supported irrigation systems move during irrigation of land areas, changes in grade occur due to unevenness of the land surface. It is necessary that the various pipe sections that interfit to transport water from the water supply to the irrigation system be capable of vertical movement to accomodate changes in grade as well as accommodating horizontal angular misalignment responsive to tower movement. Coupled irrigation pipes with a pipe coupling that efficiently allows universal movement of the connected pipe sections so as to prevent the development of any strains that might otherwise cause deterioration of the connections between the pipe sections is provided in this invention. Another feature presents a substantially unobstructed flow passage for the water being supplied, allowing the capability of the water supply pumping system to be minimized for a given volume of water that is supplied. (Sinha-OEIS)
W77-08875

EFFECTS OF TREATED MUNICIPAL WASTEWATER AND COMMERCIAL FERTILIZER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN AND AMINO ACID CONTENT IN WHEAT HAY,
Arizona Agricultural Experiment Station, Tucson.
For primary bibliographic entry see Field 5C
W77-08876

EVALUATION OF WHEAT PLANTS WITH REGARD TO DROUGHT- AND HEAT-RESISTANCE UNDER FIELD CONDITIONS, (IN RUSSIAN),
Akademiya Nauk Kazakhskoi SSR, Alma-Ata. Institut Botaniki.
F. A. Polimbetova, L. K. Mamonov, G. G. Kim, E. A. Vorob'eva, and S. A. Skripka.
S-Kh Biol. 9(2), p 235-237, 1974.

Descriptors: *Drought resistance, *Wheat, *Crop production, *Heat resistance, *Drought tolerance, Crop response, Moisture stress.

Field evaluation of 78 samples of soft wheat in relation to their productivity and origin was done. A positive correlation between drought- and heat-resistance was found, the level of correlation depending on the origin of the varieties.--Copyright 1975, Biological Abstracts, Inc.
W77-08877

FLOW RESTRICTOR AND TRICKLE EMITTER,
M. Lemelshtrich.
U.S. Patent No 3,998,391, 7 p, 10 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1043, December 21, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Flow, Flow control.
Identifiers: Drip irrigation, *Flow restrictor(Irrigation).

The purpose of a flow restrictor is to retard the flow within a predetermined conduit and to reduce the pressure from the head of the source of irrigation water. As a consequence the flow is emitted in the form of a very slow trickle or dropwise. This results in economy in water expenditure and supplies the water in a steady, slow trickle to the point where it is actually needed by the plants or cultures to be irrigated. The invention is a further development of such a flow restrictor and emitter. It is composed of a hollow plate-like element in the interior of a conduit. The conduit has an inlet adapted to be connected to a feed line of water and at least one outlet leading into the open. This conduit meanders from the inlet of the element to the outlet forcing the flow to perform bows and bends within the conduit. (Sinha-OEIS)
W77-08879

EASILY MOVABLE IRRIGATION SPRINKLER SYSTEM,
J. C. St Clair.
U.S. Patent No 3,998,392, 6 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1044, December 21, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Distribution systems, Application equipment.

A sprinkler system weighing, when automatically drained, under 20 pounds per 1000 foot of tubing plus sprinkler heads and, that can be rapidly rolled up by a tractor carrying a reel, is made of two concentric polyester plastic tubes both 2 inches in diameter with 0.001 inch thick walls. The two concentric tubes are sealed together at the top and 0.04 inch diameter holes are spaced at 6 foot intervals along the top seal so that water flowing through the inner tube can spray out. The outer tube is aluminized to protect the polyester against the sun and a black stripe is painted along the top of the outer tube so that photoelectric cells can make the spray holes along the black line be unrolled on top when the irrigation tubing is put in place. When it is desired to move the irrigation tubing, the water is shut off and air is forced between the inner and outer tubes. This forces the water out of the inner tube making an extremely light load to roll up and carry. (Sinha-OEIS)
W77-08880

IRRIGATION SPRINKLING APPARATUS WITH ADJUSTABLE GROUND CONTACTING ELEMENTS,
Gifford-Hill and Co., Inc., Spokane, Wash. (Assignee).
H. E. Lindner, and J. E. Mertaugh.
U.S. Patent No. 3,999,569, 10 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1449, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Distribution systems, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water conveyance.

The invention describes irrigation apparatus adapted for rotation about a fixed point for irrigation of large generally circular land areas. It is directed to means for establishing positioning between the ground contacting elements of the irrigation apparatus and the respective mobile bases of the apparatus so as to allow the ground contacting elements to be positioned either in an operative position during irrigation operations or in a linear movement position, allowing the apparatus to be moved linearly to other locations in erected condition. It provides precise adjustment between the ground contacting elements of the irrigation apparatus and the respective mobile bases in order to allow wheels, for example, to precisely track an arc about the pivot point during irrigation operations. (Sinha-OEIS)
W77-08886

IRRIGATION DRAIN VALVE,
Ireco Industries, Inc., Eugene, Oreg. (Assignee).
L. W. Clements.
U.S. Patent No. 3,999,570, 3 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1449-1450, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Flow control, Valves.

The object of the invention is to provide an irrigation drain valve which dissipates the force of water being drained before discharging the water. A valve body has a large threaded inlet portion adapted to be screwed into an irrigation coupling, and also has a large inlet, a tapered portion leading from the inlet to a smaller outlet portion adapted to be screwed into an irrigation coupling, and also has a large inlet, a tapered portion leading from the inlet to a smaller outlet portion with an O-ring seal in a groove in the tapered portion and a cup at the end of the outlet portion to turbulate the water. A valve closure member has a tapered head and a stem, slidable in the body, and a spring urges the head away from the O-ring seal. A nut on the stem limits movement of the valve closure member by the spring. (Sinha-OEIS)
W77-08887

ROTARY WATER SPRINKLER,
Mifal Leyitzur Mamtirim Veavizarei Hashkaya Bekibbutz Dan, Kibbutz Dan (Israel). (Assignee).
O. Katzman.
U.S. Patent No. 3,999,711, 4 p, 1 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1497, December 28, 1976.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Pressure.

A rotary water sprinkler has a housing articulatedly rotatable about a central supply coupling with an outflow nozzle fixedly mounted with respect to the housing. The coupling is screw coupled to a supply pipe. With such rotary water sprinklers, the housing and in consequence, the outflow nozzle or nozzles rotate continuously or intermittently as water flows under pressure from the supply and a circular area is sprayed. The outflow pressure can lead to variations. Such variations can be particularly disturbing when a network of sprinklers is employed, each constituent sprinkler being arranged to spray a specific area. A direct cause of such variations in output pressures are variations in the supply pressure in the mains or variations in ground level. The object of the invention is to provide a rotary water sprinkler having means to reduce to a minimum the variations in outflow pressure. (Sinha-OEIS)
W77-08888

GRAVITATIONAL IRRIGATION SYSTEM AND METHOD OF INSTALLING,
M. M. Burge.
U.S. Patent No. 4,000,620, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation practice, *Irrigation efficiency, Distribution systems, Application equipment.
Identifiers: Plastic tubing, Drip irrigation.

A gravitational irrigation system uses preformed, water-impervious flexible, collapsible plastic tubing. The tubing is laid in a shallow trench adjacent the area to be irrigated. Spades of soil are thrown at spaced intervals over the tubing to hold it in place in the trench. One end of the tubing is con-

nected to a source of water and the other end is restricted to control exit of water. Annular apertures are cut in the tubing at intervals along the tubing where exit of water is desired and flexible, open-ended, annular spigots extended through the apertures, allowing water to exit from the tubing. The outer circumference of the spigot has a raised annular ridge on it which mates with a corresponding raised ridge extending around the internal surface of a matching, closed-end cap for the spigot to seal the spigot against exit of water. (Sinha-OEIS)
W77-08895

SPRINKLER HAVING IMPROVED WATER DISTRIBUTION,
M. Drori.
U.S. Patent No. 4,000,853, 6 p, 11 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 215, January 4, 1977.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation practices, *Irrigation efficiency, Application equipment, Water delivery.

A rotary sprinkler comprises: a sprinkler head connected to a water supply pipe and having a nozzle through which water passes in the form of a jet; a spring-biased pivotably-mounted arm impinged by the water jet and oscillated; and a deflector carried by the arm and oscillated across the path of the water jet. The deflector includes a lower edge placed at an angle to and intercepting the line of impingement as it oscillates back and forth across the path of the water jet so that the lower edge intercepts an increasing area of the water jet section to deflect it downward during one direction of movement of the arm, and a decreasing area to deflect during the opposite direction of movement of the arm. The sprinkled water is therefore distributed uniformly from the sprinkler nozzle. (Sinha-OEIS)
W77-08899

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08934

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W77-08601

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W77-08602

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
For primary bibliographic entry see Field 6C.
W77-08604

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08610

FLOOD PLAIN INFORMATION: ALBUQUERQUE ARROYAS, PART V, ALBUQUERQUE, NEW MEXICO.
Army Engineer District, Albuquerque, New Mex.
Prepared for Albuquerque Metropolitan Arroyo Flood Control Authority, April 1975. 33 p, 4 fig, 18 plates, 5 tab.

Descriptors: *New Mexico, *Floods, Flooding, *Flash floods, *Flood profiles, *Erosion, Deposition(Sediments), *Flood plains, Silting, *Arroyos, *Control structures, Streamflow forecasting, Maximum probable flood, Channels, Obstructions to flow, Non-structural alternatives, Flood plain zoning, Building codes, Zoning, Dams, Diversion structures, Channel improvement, Floodproofing, Arid lands, Arid climates, Rio Grande River.
Identifiers: *Albuquerque Arroyos(NM), Albuquerque(NM), Standard Project Flood, Intermediate Regional Flood.

Flood plains of this study area in the southeast quadrant of Albuquerque remained relatively undeveloped, though there are 250 homes and new construction is gaining momentum as pressures for development continue unabated. Three unnamed arroyos, with a total drainage of about 2.55 sq mi, are studied. Most flood producing storms over this subbasin occur in July and August when almost half of total precipitation occurs. Thunderstorms produce flash floods in summer, but in winter there is little threat of flooding from occurring rainstorms. For an Intermediate Regional Flood, peak discharges of 1,240 cubic ft/sec (cfs), 570 cfs and 430 cfs are predicted for the three arroyos with water velocities in the channel up to 9.6 ft/sec and negligible overbank flow. In a Standard Project Flood peak discharges of 1,700 cfs, 800 cfs and 600 cfs are predicted and velocities up to 10.4 ft/sec with negligible overbank flow. Most bridges and culverts across the arroyos would be obstructive to flood flow. It is assumed that the now-abandoned railroad bridge across one arroyo would wash out. Silting can be a major problem at these obstructions. At the time of this study some of the culverts were partially blocked with silt. Both structural and non-structural flood protection works have been undertaken. These include several dam projects, diversion channels, channel improvements and building regulations. Guidelines for flood management useful to local authorities are set forth. (Smith-North Carolina)
W77-08611

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, FORT DODGE - WILROADS GARDENS, VICINITY OF DODGE CITY, KANSAS.
Army Engineer District, Albuquerque, New Mex.
Prepared for Dodge City and Ford County, KS, June 1970. 8 p, 3 fig, 6 plates, 1 tab.

Descriptors: *Kansas, *Floods, Flooding, *Flood profiles, *Flood plains, Streamflow forecasting, Maximum probable flood, Flood data, Peak discharge, Levee, Dams.
Identifiers: *Arkansas River(KS), Dodge City(KS), *Wilroads Gardens(KS), Standard Project Flood, Intermediate Regional Flood, John Martin Dam(CO).

Developments in the flood plains of this study area are small-acreage farmsteads, buildings, including a hospital and a power plant and several roads. Above Dodge City the watershed of the Arkansas River is 30,600 sq mi including 5,583 sq mi classified as noncontributing. The major contributing sub-basin is controlled 188 mi upstream by John Martin Dam. Stream records are continuous from 1944, but are also available for 1902 1932 from a non-recording gage. In 1921 a flood had a peak discharge of 32,000 cfs, but the 1965 flood was considerably larger at 82,000 cfs, reaching a height of 1.8 feet above a Standard Project Flood (SPF). In Wilroads Gardens waters reached up to 7 feet in some locations and losses were put at $337,000 including damage to roads, utilities, a school and church, 2 businesses and 86 residences. A local levee also failed. The flood resulted from heavy rainfall in the watershed below the dam. Storms of this nature occur frequently in May through August. In an Intermediate Regional Flood (IRF) a peak discharge of 52,000 cfs can be expected along with water velocities of 9.1 feet per second in the main channel and 2.9 ft/sec in the overbank area. A SPF would have a peak discharge of 74,700 cfs and velocities of 10 and 3.1 ft/sec in the main channel and overbank areas, respectively. The IRF would rise to peak in about 14 hours hours and last 45 hours, and the SPF would reach peak in 18 hours and last 62 hours. A major bridge across the stream would not be topped by either flood. Aside from the earth levee, which provides protection for a 30-year flood, no flood control has been undertaken in the area. (Smith-North Carolina)
W77-08612

SPECIAL FLOOD HAZARD INFORMATION REPORT: MISSOURI AND KANSAS RIVERS, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Kans.
Prepared for City of Kansas City, KA, January 1972. unp, 2 fig, 6 plates.

Descriptors: *Kansas, *Floods, *Historic floods, *Flood data, *Flood damage, *Flood plains, *Reservoirs, Flood profiles, Control structures, Levee, Floodwalls, Channel improvement, Storm sewers, *Missouri River, *Missouri.
Identifiers: *Kansas River(KA), *Kansas City(KA), Kersey Creek(KA), Standard Project Flood, Intermediate Regional Flood.

The remaining flood hazards within the city of Kansas City (KA) are summarized. Kansas City is located at the confluence of the Kansas and Missouri Rivers and has over 8,000 acres of flood plains of these streams within its city limits. About 7,200 acres has evolved into highly industrialized complexes in several major districts of the city. The areas are flat and conveniently located, each employing thousands of persons. Major floods occurred in 1844 and 1903 when both rivers flooded the area at the same time. In 1951 the uncontrolled Kansas River along produced the most disastrous flood yet recorded. The two earlier events caused relatively little damage in comparison to the 1951 flood which caused $350 million in damages. Failure of the Argentine District levee system, which was uncompleted at the time, signalled the devastation to come for the metropolitan area. Flood waters overwhelmed levees and floodwalls in the important districts of the city. Damages included loss of life. In response to the 1951 flood, raising existing levees, extending floodwalls, storm drainage and channel improvements have been undertaken to protect the city from a flood of a 500-year frequency (Standard Project Flood). Armourdale Industrial District and the Central In-

dustrial District, presently protected against a flood of 100-year frequency (Intermediate Regional Flood), must have floodwalls and levees raised to protect them against a Standard Project Flood. These additional safeguards are planned for completion by 1977. Until all parts of the protective works are completed a flood hazard situation exists. Three additional reservoirs have been authorized for the Kansas River Basin. (Smith-North Carolina)
W77-08613

FLOOD PLAIN INFORMATION: OHIO RIVER, LAWRENCE COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
Prepared for the State of Ohio, Department of Natural Resources. June 1973. 32 p, 11 fig, 18 plates, 2 tab.

Descriptors: *Ohio River, *Floods, *Flood damage, *Flood profiles, *Flood data, *Historic floods, *Dams, *Reservoirs, *Ohio, Flood flow, Peak discharge, Flow duration, Levees.
Identifiers: Ironton(OH), Intermediate Regional Flood, Lawrence County(OH), Proctorville(OH), Chesapeake(OH), Coal Grove(OH).

In this study area the Ohio River flows southward from Crown City, westward through Huntington, WV and Chesapeake, OH, then northwest for 43 mi along the boundary of Lawrence County. Its flood plains, ranging from 2,000 ft to 8,600 ft. contain commercial and residential development. Floods are caused by excessive rain from widespread spring and winter storms. Floods crest slowly (less than one-half ft per hr) and remain above bankfull for extended periods. Tributary streams and their flood plains experience backwater flooding from the Ohio River. Earthen levees, flood walls and pumping stations at Ironton, OH, protect heavily developed areas of the city. There are no flood plain zoning ordinances, building codes or other regulatory measures intended to reduce flood damage within the study reach. Thirty-seven reservoirs upstream from Ironton significantly reduce flood heights. Eight additional reservoirs are being built. A series of rainstorms created the largest recorded flood in January-February 1937. The flood created 69.4 ft above zero point on gage with an estimated peak discharge of 654,000 cubic feet per second. Ironton was inundated by 11 ft of water and completely isolated from rail and highway travel. The profile of the 1937 flood may be taken as the reasonable upper limit of probable future flooding along this stretch of the river. An Intermediate Regional Flood (IRF) is expected to crest at 552.2 ft mean sea level, 7 ft above the 1937 flood. The town of Proctorville, bottomland surrounding it, portions of Chesapeake and Coal Grove, and all of the bottomland just outside of the Ironton local protection project would be subject to great depths of flooding during an IRF. (Salzman-North Carolina)
W77-08614

FLOOD PLAIN INFORMATION: ASHUELOT RIVER, CITY OF KEENE, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass. New England Div.
Prepared for the Town of Keene, NH, December 1972. 26 p, 11 fig, 3 plates, 6 tab.

Descriptors: *Floods, Flooding, *Peak discharge, *Flow characteristics, *Flood plains, *Flood protection, *Dams, *New Hampshire, Flood data, Flood stages, Flow duration, Flood damage, Control structures, Obstructions to flow, Snowmelt.
Identifiers: *Ashuelot River(NH), Keene(NH), Faulkner and Colony Dam(NH), Intermediate Regional Flood, Standard Project Flood, Flood Plain Management Program.

The Ashuelot River, a major tributary of the Connecticut River, flows southwesterly in a meandering fashion through Keene, the economic center for the Ashuelot River watershed. With a negligible slope in the study area, the river channel has little discharge capacity and considerable depth of ponding is possible in the flood plain. The flood plains contain much residential, commercial and industrial property and pressure for development is increasing. Main flood season is in the spring when floods result from rains combined with melting snow. Intense rainfall from local thunderstorms also cause floods. A steep upper watershed area contributes to rapid runoff in the flood plain at Keene. Although the Faulkner and Colony Dam has no flood control capacity, 2 flood control dams in the upper watershed provide some protection. The city of Keene is responsible for operation and maintenance of the local protection project completed in 1954. Located along the Ashuelot River from the railroad bridge in Keene to the covered bridge at Swanzey Station, the improvement increases the usability of farm lands along the river and aids functioning of the drainage and sewerage systems. The flood with the greatest peak discharge occurred in 1938 when a flow of 18,800 cubic feet per second was recorded and a water epth of 475.3 mean sea level datum at telemark gage in Keene. An Intermediate Regional Flood and a Standard Project Flood would crest at 471.7 and 472.7 ft msld, respectively, and have peak discharges of 18,800 cfs and 22,000 cfs. This report furnishes a suitable basis for the adoption of land use controls and flood damage reduction techniques to develop a flood plain management program. (Salzman-North Carolina)
W77-08615

SPECIAL FLOOD HAZARD REPORT: BUFFALO CREEK, MEADOW GROVE, NEBRASKA.
Army Engineer District, Omaha, Nebr.
Prepared for the Village of Meadow Grove and the Nebraska Soil and Water Conservation Commission, June 1971. 14 p, 2 tab, 3 plates, 4 fig.

Descriptors: *Floods, *Peak discharge, *Flood plains, *Flood protection, *Channel improvement, *Nebraska(NB), *Flood profiles, Flooding, Historic floods, Flood data, Flow characteristics, Flood damage, Flood routing, Obstruction to flow.
Identifiers: *Buffalo Creek(NB), Meadow Grove(NB), Intermediate Regional Flood, Standard Project Flood.

This report was prepared to define the remaining flood threat along Buffalo Creek as it passes through Meadow Grove after construction of a proposed channel improvement project which should reduce flood damages about 80%. Buffalo Creek, which drains 21 square miles, has short tributaries that are sharply eroded into the hills along the creek as it meanders through the basin. The flood plain, relatively narrow in the upper basin, spreads out without definable limits. Deposition of silt from earlier floods has created somewhat higher ground close to the creek. A railway bridge, the bridge at Highway 275 and the Lewis Street extension limit flood flows. Floods usually result from severe thunderstorms and are characterized by rapid peaking and short duration. Most of Meadow Grove is subject to flooding by major floods. Six major floods have occurred in the past 33 years. In May 1944 a flood which had a peak discharge of 6,200 cubic feet per second caused damages of $144,000 at 1970 prices. In 1960 the largest flood caused damage estimated at $149,000. The improved channel will be nearly three times as wide as the old channel with sharp curves eliminated. Flow not exceeding 5,400 cfs can be carried in the new channel without overbank flooding. An intermediate Regional Flood would have a peak discharge of 9800 cfs or 58% greater than the 1944 flood. A Standard Project Flood would have a peak discharge of 19,400 cfs inundating most of the village. 'Depths of overbank flow would be shallow, usually less than 2 feet, except at the upstream side of road crossings where depths may be greater.' (Hufschmidt-North Carolina)
W77-08616

FLOOD PLAIN INFORMATION REPORT, INDIAN AND DRY CREEKS, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
Prepared for the Iowa State Natural Resources Council, December 1969. 27 p, 2 tab, 12 plates, 11 photos.

Descriptors: *Floods, *Flood control, *Flood data, *Flood profiles, *Non-structural alternatives, *Iowa, Historic floods, Flood frequency, Flood plain zoning, Building codes, Flood peak, Flood plains, Standard Project Flood.
Identifiers: *Cedar Rapids(IA), Dry Creek(IA), Indian Creek(IA), Marion(IA), Hiawatha(IA), Linn County(IA), Intermediate Regional Flood, Encroachment lines.

The study area involves 93.0 square miles of the Indian Creek and Dry Creek watershed in Linn County, IA, including the cities of Cedar Rapids, Marion, and Hiawatha. Development in the flood plain is not extensive, consisting primarily of agricultural land with scattered industrial and residential sites. Damage from past floods has consequently been light. Extensive future developments in the flood plain are anticipated due to population growth trends. Data were obtained from county records, newspaper files, and historical documents. Flooding usually occurs in the late winter and early spring and is caused by snowmelt, heavy general rains, or both. Intense local storms can cause floods at other times. Recent major floods occurred in January and April 1960, and March and November 1961. As in many previous years, damage was concentrated in lower flood plain, in and around Cedar Rapids. At the lower study limit, the Intermediate Regional Flood will discharge 22,000 cubic feet/sec, and the Standard Project Flood will discharge 31,100 cfs. Additional flood plain development will increase flood crest levels. Although intended for informational purposes, this report also describes non-structural flood control measures, including encroachment lines, zoning, subdivision regulations, building codes, and flood control regulations. (Nessa-NC)
W77-08617

FLOOD HAZARD INFORMATION: YAMPA RIVER AND TRIBUTARIES, STEAMBOAT SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
Prepared for Routt County Regional Planning Commission, February 1976. 13 p, 3 fig, 5 tab, 27 plates.

Descriptors: *Floods, Flooding, *Peak discharge, *Flood profiles, *Snowmelt, Flood data, Flood stages, Flow characteristics, Flood plains, Planning, Historic floods, *Colorado.
Identifiers: *Yampa River(CO), Soda Creek(CO), Butcherknife Creek(CO), Spring Creek(CO), Fish Creek(CO), Walton(CO), Burgess Creek(CO), *Steamboat Springs(CO), Intermediate Regional Flood, Standard Project Flood.

This report covers the Yampa River, a tributary of the Colorado River via the Green River, for 6.4 mi and lower reaches of its tributaries, Soda, Butcherknife, Spring, Fish, Walton and Burgess Creeks. All direct tributaries join the river in Steamboat Springs, a ski resort with a permanent population of about 5,000 supplemented by an almost equal number of winter transients plus summer tourists. Much of the annual precipitation occurs as snow and a deep snowpack develops. In late spring through early summer snowmelt augmented by rain causes flooding. General rainstorms over the Yampa River Basin have not caused significant floods. However, major flood producing rainstorms occur over western CO in September and October. Major floods occurred in June 1921 and April 1974 with the former having a peak discharge of 7,000 cubic ft per second on the Yampa, an estimated 2,000 cfs along Soda Creek. In 1974 stages on all streams in the Steamboat Springs area were higher than at any time in recent history. Many homes were damaged. Most bridges

and culverts in the city impede flood flow. There are no flood control projects in the study area. Using a standard project storm centered over the Grand Mesa area, estimates were made for peak flows in study area: for a 100-year flood (cfs)-Yampa River at Steamboat Springs 8,000; Soda Creek 1,300; Butcherknife Creek 320; Spring Creek 650; Fish Creek 1,800; Walton Creek 2,700; Burgess Creek 260. For a 500-year flood(cfs)-Yampa River 20,000; Soda 2,900; Butcherknife 1,300; Spring 2,400; Fish 4,600; Walton 5,600; Burgess, 1,400. Main channel velocities for Yampa River would average 10 ft/sec in a 100-year flood which could inundate about 670 acres. (Salzman-North)
W77-08619

FLOOD PLAIN INFORMATION: LLAGAS CREEK UNIT I, INCLUDING EDMUNDSON (LITTLE LLAGAS), CHURCH, SAN MARTIN, NEW, CENTER, CORRALITOS, TENNANT, MAPLE, AND FOOTHILL CREEKS, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
Prepared for Santa Clara Valley Water District, CA, July 1975. 31 p, 22 fig, 44 plates, 6 tab.

Descriptors: *California, *Floods, *Flash flood, *Flood profiles, *Flood plains, *Reservoirs, *Flood control, Flooding, Overflow, Streamflow forecasting, Design flood, Historic floods, Flood data, Peak discharge, Bank erosion, Obstructions to flow, Control structures, Water storage, Diversion structures, Channel improvement.
Identifiers: *Llagas Creek(Calif), *Edmundson Creek(CA), *Little Llagas Creek(CA), Standard Project Flood, Intermediate Regional Flood, San Martin Creek(CA), Corralitos Creek(CA), Foothill Creek(CA), New Creek(CA), Tennant Creek(CA), Chesbro Reservoir(CA), Church Creek(CA), Center Creek(CA), Maple Creek(CA).

Watersheds of Unit I are located on both east and west sides of South Santa Clara Valley. West side watersheds include upper reaches of Llagas Creek, Edmundson (Little Llagas) Creek and West Little Llagas Creek. East side watersheds include upper reaches of Church, New, Center, Corralitos, Tennant, Maple and Foothill Creeks. Most of the flood plain lands have agricultural uses but intensive residential and commercial development is anticipated. Most precipitation occurs from December through March with 18 to 45 inches annual precipitation on the west side, about 18 inches on the east side. Floods rise quickly, do not last long. Chesbro Reservoir on Llagos Creek, built in 1955, provides some degree of flood protection. In an Intermediate Regional Flood (IRF) a peak discharge of 5,600 cubic feet per second is expected on Llagos Creek and peak discharges of generally less than 1,000 cfs on tributaries in the Llagas Creek area. Water velocities could be from 4 to 17 ft/sec in upper reaches and 4 to 14 ft/sec in lower reaches. Overbank flow is predicted at 1 to 4 ft/sec. In a Standard Project Flood, peak discharges of 6,300 cfs on Llagas Creek are predicted, with as much as 1,400 cfs on smaller tributaries. Water velocities will be slightly higher than in the IRF. In either flood, overflow from water courses is expected. Sixteen of 22 bridges are expected to obstruct flood flow. Some additional flood protection measures undertaken are the partially implemented Upper Llagas Creek Watershed Work Plan and construction of a new channel which will divert some creeks. Construction of a supplementary water supply to the nearby Hayes Valley could reduce peak flows on Llagas Creek. (Smith-North Carolina)
W77-08620

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6G.
W77-08721

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 6B.
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08727

FLOODS IN THE BIG CREEK BASIN, LINN COUNTY, IOWA,
Geological Survey, Iowa City, Iowa. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08731

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08738

OUTLINE OF THE WATER RESOURCES OF THE SATUS CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08740

MISSOURI STREAM AND SPRINGFLOW CHARACTERISTICS LOW-FLOW FREQUENCY AND FLOW DURATION,
Geological Survey, Rolla, Mo. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08743

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08745

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
H. L. Shindel, and L. A. Wagner.
New York State Department of Environmental Conservation, Albany, Report of Investigations RI-16, 1977. 18 p, 6 fig, 4 tab, 10 ref.

Descriptors: *Streamflow, *Travel time, *Path of pollutants, *Tracking techniques, *Dye releases, *New York, Flow rates, Dye concentrations, Data collections, On-site investigations, Forecasting.
Identifiers: *Black River(NY), Lyons Falls-Dexter area(NY).

Time of travel of water was determined at three different times for 16 successive subreaches of the 72-mile reach of the Black River between Lyons Falls and Dexter, New York. A 40-percent solution of rhodamine B dye and 20-percent solution of rodamine WT dye were used on different occasions as tracers to measure the time of travel. Cumulative time of travel of the peak dye concentration was 115 hours for a flow of about 40-percent duration and 173 hours for a flow of about 85-percent duration. Time-of-travel data for each subreach and cumulative time-of-travel graphs for the entire reach for various discharges are presented. Dye-dispersion and peak-concentration data are give also. Graphs show the relationship between traveltime and peak dye concentration for different rates of discharge through the subreaches. (Woodard-USGS)
W77-08747

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08748

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08755

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 4B.
W77-08810

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
For primary bibliographic entry see Field 4C.
W77-08830

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT ON RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 4C.

W77-08831

EFFECT OF PONDS AND SMALL RESERVOIRS ON RIVER RUNOFF IN THE FOREST-STEPPE AND STEPPE ZONES OF THE VOLGA BASIN,
V. Z. Rodionov.
Soviet Hydrology, Selected Papers, No. 4, p 288-295, 1975. 2 fig, 5 tab, 13 ref. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No. 229, p 106-122, 1975.

Descriptors: *Runoff, *Ponds, *Reservoirs, Effects, Grasslands, Forests, Storage, Water storage, Evaporation, Reservoir evaporation, Watersheds(Basins), Ravines, Foreign countries, Foreign research, Gullies, Rivers, Streams.
Identifiers: *Volga Basin(USSR), *USSR.

The forest-steppe and steppe zones of the Volga basin include the Central Russian Upland, the northern part of the Oka-Don valley, and the Volga Hills. This area extends for more than 1000 km from west to east. The mentioned territory belongs mainly to the zone of deficient moisture, where most of the river runoff occurs during the spring flood period. The numerous ponds and reservoirs of the dry zones are desinged for spring flood runoff storage and for its utilization during the low-flow period for industrial purposes (mainly irrigation and water supply). The effect of ponds and reservoirs on the runoff or rivers of the forest-steppe and steppe zones of the Volga basin obeys the law of geographic zonality. The change in runoff increases from the northwest to the southwest as river water utilization increases and the total river flow decreases. The reduction in the runoff of rivers in the zone of sufficient and variable moisture is 1% in a moderately wet year and 2% in a dry year The reduction for rivers in the moisture deficient zone averages 3 and 6%, respectively, and in the dry zone, reduction reaches 24 and 4%. Because of the mentioned mass construction of ponds and reservoirs everywhere, the change in river runoff will be more considerble, especially in the dry regions of the Volga basin. (Sims-ISWS)
W77-08834

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
For primary bibliographic entry see Field 4D.
W77-08841

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08843

PRESSURE REDUCING VALVES IN PIPE NETWORK ANALYSES,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-08855

ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
For primary bibliographic entry see Field 6B.
W77-08856

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W77-08858

ECONOMIC ROLE OF THE WATERWAY IN WESTERN EUROPE,
Port of Strasbourg (France).
M. Marchal.
Journal of the Waterways, Harbors and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. WW3, Proceedings paper No. 12346, August 1976, p 337-346. 2 tab, 1 ref.

Descriptors: *Channels, *Transportation, *Regional development, Canals, Canal design, Planning, Costs, Navigation.
Identifiers: *Economic analysis, *Industrial growth, *Western Europe, *Waterways, Economic decentralization, Ocean ports, Impact.

Thanks to the development of new, highly efficient techniques of navigation, inland navigation along large gage canalized waterways can offer an efficient, modern, and cheap mode of transportation. In Western Europe, the waterway is not only a mode of transportation, but its improvement can serve urban development, create recreational facilities, and help in flood control. The specific impact of large gage waterways on the economic and industrial development is the result of (1) the assurance that industries located in their vicinity still simultaneously experience a substantial and permanent decrease of their transportation costs and an increase in their size and influence; and (2) additional advantages offered to factories located on their banks, resulting in increased profit margins and reinvestments capabilities. Such advantages can only be felt, however, if the waterway crosses regions of high urban and industrial density and links zones of development of sufficient economic dimensions. (Bell-Cornell)
W77-08860

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-08863

PHILADELPHIA'S WATER SYSTEM AUTOMATION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
For primary bibliographic entry see Field 5F.
W77-08864

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08867

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

SINKAGE AND RESISTANCE FOR SHIPS IN CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W77-08873

DUNE STABILIZATION WITH PANICUM AMARUM ALONG THE NORTH CAROLINA COAST,
North Carolina State Univ. at Raleigh. Dept. of Botany; and North Carolina State Univ. at Raleigh. Dept. of Soil Science.
For primary bibliographic entry see Field 2L.
W77-08908

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
T. E. Maki, W. Hazel, and A. J. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 021, Price codes: A04 in paper copy, A01 in microfiche. Completion Report, October 1975. 41 p, 23 fig, 5 tab. OWRT A-085-NC(3), 14-31-0001-5033.

Descriptors: *Forest management, *Forest soils, *Ecosystems, *Channeling, *Swamps, *Channel improvement, Surface-groundwater relationships, Natural streams, Intermittent streams, Observation wells, *North Carolina.
Identifiers: *Stream channelization, Non-channelized streams, *Swamp forest ecosystems, Gates County(NC).

The general objective was to develop better understanding of the swamp forest ecosystem, including its dominant and subsidiary vegetation communities, its associated fauna, soil properties and surface stratigraphy, and the hydrology in relation to alterations of the 'natural' drainage regime. Sixteen well lines were established, representing eight channelized situations and eight non-channelized situations in ten stream bottoms from Craven County northward to Gates County, N.C., covering over a hundred miles of Coastal Plain. Within each of the eight well-line categories, 4 lines are in recently cut-over tracts and 4 are within tracts that have not seen logging activities for several decades. Some tentative conclusions from the first year's study are: (1) The swamp forest ecosystems of eastern North Carolina are largely dominated by quantities of cull trees which are the residual elements from high-grading logging operations during the past 150 years or more. (2) Surface soils to depths of 40 cm or so are quite uniform in texture and composition, with texture averaging 70 to 80 percent clay. (3) Channelized streams maintain perennial and clear flow during droughty periods in sharp contrast to the murky water in natural streams during low flow. (4) Clear-cutting substantially affects the soil moisture regime because of the temporary reduction in evapotranspiration draft. (Stewart-NC State)
W77-08920

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08922

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5B.
W77-08932

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
D. W. Bree, Jr., D. H. Budenaers, D. N. Horgan, Jr., and L. C. Markel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 964, Price codes: A10 in paper copy, A01 in microfiche. Final Report, June 1976, 192 p. OWRT C-6198(No.5221)(1).

Descriptors: *Water distribution(Applied), Operations, Planning, Networks, *Water demand, *Computer models, Water control, *Forecasting,

*Distribution systems, *Methodology, Design, *Algorithms.
Identifiers: Operations planning, Water demand forecasting, Storage forecasting, Control software implementation.

Results are presented of a project that was directed to the development of prototype algorithms for real-time computer control of water distribution systems. The objective was to improve the capability of a water system operator/dispatcher to control the operation of this system. This is accomplished by providing computerized 'tools' which forecast and simulate system conditions, allowing the dispatcher to estimate the consequences of his control decisions before he takes action. The approach, briefly stated, is to use a reduced network model and system load forecast to simulate operation of the water system (i.e., determine the storage forecast in order to provide information to the system controller (human dispatcher or computerized optimization algorithm) which will aid in dispatching the system to meet all constraints and requirements at the lowest possible cost. Part I of this report is an overview of the work done, Part II, an Implementation Guide, describes the steps to be taken by a water utility to implement on its own system the techniques and programs described here. Part III consists of Technical Appendices describing in detail the structure and derivation of the algorithms developed. Part IV is the documentation of computer programs. (See also W77-0894 and W77-08942)
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
M. Piccardo, W. Winkler, and R. Siegel.
Final Report, (1976), 297 p. OWRT C-6198(No.5221)(2).

Descriptors: *Computer programs, *Water distribution(Applied), Water demand, Computer models, Forecasting, Estimating, Water control, Documentation, Methodology.
Identifiers: Computer program documentation.

This documentation covers computer programs associated with analysis and forecasting of water demand and related data. The programs can be divided into four categories: initialization, estimation, forecasting, and verification. (1) The initialization programs provide a beginning for analysis; these are subroutines which produced printer plots--histograms, time series plots, and scatter plots. The routines can be used to plot water demand over time, to plot water demand versus particular weather variables, etc., in order to understand the structure of the data. The subroutines can also be used to plot results of statistical analyses for purposes of clarification; the plotting routines are described in a separate section. (2) Helpful in leading towards a particular forecasting model are the estimation programs. One program performs quadratic regression and other performs correlation and auto-correlation analysis and for determining a forecasting model based on exogenous variables, principal components analysis is documented. (3) Forecasting programs have been developed (using San Jose Water Works data) to be used in total or adapted. The stochastic forecasting model is documented, as is a forecasting program based on weather variables. (4) Two programs were written which help to determine the accept-ability of the forecasting model. A program is described which analyzes the residuals (differences between forecasted and actual demand) produced by a single forecasting model. Also a program is described that analyzes the residuals of the stochastic and weather models jointly. (See also W77-08940 and W77-008942)
W77-08941

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08942

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08943

FLORIDA'S BARGE CANAL PROSPECTS FOR THE FUTURE,
Florida State Univ., Tallahassee. Dept. of Ichthyology.
H. A. Beecher.
National Parks and Conservation Magazine, Vol 48, No 9, p 14-19 (1974). 1 map, 7 photo.

Descriptors: *Florida, *Canals, *Canal construction, *Canal design, *Environmental effects, Environmental control, Environmental engineering, Environment, Canal embankments, Channels, Engineering structures, Hydraulic structures, Civil engineering, Design flow, Ditches, Inland waterways, Saline water intrusion, Excavation.
Identifiers: *Injunctive relief, Cross-Florida Barge Canal.

Evaluated in this article are the past history and future prospects of the Cross-Florida Barge Canal. Although the idea for such a canal was originally conceived in the early 1800's, actual construction did not begin until the depression when it was maintained for a year to provide jobs for the unemployed. Construction began again in 1964 and continued until January, 1971, when a temporary injunction necessitated its halt. Conflicting reports have been produced by both sides of the construction issues and have resulted in many false predictions concerning the economic advantages of the canal and its effect upon the mid-Florida environment. The author urges that action be commenced to make the best of the existing structures while construction is halted. The main focus should be upon the Ocklawaha River and Rodman Reservoir, and should include river monitoring and objective experimentation. If the long range plans are to maintain the reservoir as such, then disposal of the sediment which will be quickly deposited during the rainy seasons will have to be arranged. (Welch-Florida)
W77-08964

A 'ROUGH CUT' MODEL OF A SOUTH FLORIDA WATER SUPPLY PLAN,
Central and Southern Florida Flood Control District, West Palm Beach.
For primary bibliographic entry see Field 4B.
W77-08980

COUPLED DYNAMIC STREAMFLOW-TEMPERATURE MODELS,
Utah Water Research Lab., Logan.
For primary bibliographic entry see Field 2E.
W77-09014

MULTIVARIATE DISTRIBUTIONS IN HYDROLOGY AND RIVER REGULATION,
For primary bibliographic entry see Field 2E.
W77-09029

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
For primary bibliographic entry see Field 5B.
W77-09040

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09052

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09079

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 7B.
W77-09085

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
J. O. Shearman.
Open-file report 76-499, 1976. 103 p, 63 fig, 18 tab, 10 ref, append.

Descriptors: *Backwater, *Computer models, *Flow profiles, Encroachment, Gradually varied flow, Land use, Planning, Floodways, Flood plain insurance, Input-output analysis, Evaluation, *Computer programs.

A computer program which can be used to computer water-surface profiles for gradually varied, subcritical flow is described. Profiles are computed by the standard step-backwater method. Water-surface profiles may be obtained for both

existing stream conditions and for stream conditions as modified by encroachment. The user may specify encroachment patterns in order to establish floodway limits for land-use management alternatives, or for flood-insurance studies. Applicable theories, computer solution methods, data requirements, and input data preparation are discussed in detail. Examples are presented to illustrate the computer output and potential program applications. (Woodard-USGS)
W77-09090

4B. Groundwater Management

GROUND WATER - SOLAR HEAT,
For primary bibliographic entry see Field 8C.
W77-08652

LAND SUBSIDENCE,
National Water Well Association, Worthington, Ohio.
T. E. Gass.
Water Well Journal, Vol 31, No 5, p 30-31, May, 1977. 1 fig.

Descriptors: *Land subsidence, *Pumping, *Water wells, Groundwater recharge, Pores, Aquifers, Clays.
Identifiers: Unconsolidated materials.

Well contractors who operate in certain areas of the U.S. Southwest are probably quite familiar with the phenomenon of land subsidence. In areas that have experienced this problem, similar geological conditions are present: (1) the surface is underlain by unconsolidated or semi-consolidated formations; (2) there is a considerable clay content in the formation, and; (3) ground water withdrawal exceeds recharge. When more water is pumped out of loose granular material than is put back in, pore spaces are emptied and gradually close. The resulting land subsidence can cause costly damage to the land surface and to structures on the surface, as well as permanently reducing the ground water storage capacity of the region. Subsidence can also occur around wells that pump sand and finer particles. Land subsidence can be prevented by careful examination of subsurface formations before well development and by taking reasonable steps to manage the regional water supply afterwards. (Eberle-NWWA)
W77-08653

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
E. Martinelli.
Water S.A., Vol 1, No 2, p 53-56, July, 1975. 3 fig, 1 tab.

Descriptors: *Resistivity, *On-site investigations, Electrical studies, Saline water-freshwater interfaces, Water supply, Africa, Groundwater resources.
Identifiers: *Vertical Electric Soundings Techniques, Kalahari Gemsbok National Park(South Africa), Freshwater lenses.

Electrical resistivity survey techniques were recently used to locate and delineate fresh water lenses as sources for future water supply in the Kalahari Bemsbok National Park. Two existing wells had been drawing water of poor quality (about 10,000 ppm dissolved solids). Information from exploratory boreholes indicated that lenses of fresh water overlay deeper brackish water bodies in the area. After determining formation porosity and resistivities of the local fresh and saline ground waters via laboratory tests, field surveys of the formation were ready to be undertaken and 75 electrical soundings eventually were completed. One large continuous lens was discovered in the survey area and three subsequent boreholes into the lens produced good supplies of drinking water. (Eberle-NWWA)
W77-08654

A CASE FOR GEOTHERMAL ENERGY,
For primary bibliographic entry see Field 8C.
W77-08655

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
For primary bibliographic entry see Field 8C.
W77-08657

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
Irrigation Age, Vol. 11, No. 8, p 40, May-June, 1977.

Descriptors: *Water management(Applied), *Water policy, *Irrigation wells, *Irrigation design, Water distribution(Applied), Well permits, Well regulation, Water conservation.

During the last century, agriculture has emphasized ground water development -- the emphasis has now shifted to management and maintenance of ground water reserves. Four objectives which authorities agree are crucial are prolonging aquifers' useful lives and maintaining water levels, providing equitable distribution methods, minimizing conflicts between users, and minimizing administrative costs and problems. Increased efficiency and elimination of waste in ground water utilization are high priority concerns for designing specific areal management systems and integrating all sources of water conjunctively used for irrigation and water supply. Well spacing requirements, permits to drill, allocation / water rights, and rotational use are the tools by which planners can reach rational management goals in years ahead. (Eberle-NWWA)
W77-08660

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
J. C. Rowley.
Physics Today, Vol. 30, No. 1, p 36-45, January, 1977. 7 fig, 1 tab, 24 ref.

Descriptors: *Thermal power, *Drilling, *Geologic investigations, Research and development, *Geothermal studies, Thermal water, Geophysics, Corrosion, Drilling equipment, Logging(Recording), Energy.
Identifiers: Geopressurized systems, Dry hot rock systems, Magma systems, Rock melting drilling, Electric spark disintegration drilling.

Although the heat reservoir of the earth's interior is a promising source of energy for the future, technology will need to be developed to more readily access geothermal resources. In addition to steam and hot water geothermal systems, geopressurized systems (high-pressure brine and methane), dry hot rock systems, and magma systems could theoretically be exploited for energy production. The limiting factors preventing more widespread use of these resources today are the need for more efficient and cost-effective techniques of geothermal exploration and concomitant advances in geophysial modeling, problems with drilling into harsh environments, and corrosion of generating equipment due to high saline content of geothermal fluids. Regarding the drilling process, corrosion resistant drill string and bit materials are needed to eliminate the costly problem of drill string twist-off so common when drilling into geothermal reservoirs by conventional means. Advanced techniques such as rock melting and electric spark disintegration may prove to be excellent approaches for hot rock drilling in years to come. (Eberle-NWWA)
W77-08661

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
C. W. Kreitler.
Ground Water, Vol. 15, No. 3, p 203-214, May-June, 1977. 13 fig, 18 ref.

Descriptors: *Land subsidence, *Faults(Geology), *Water table, *Texas, Pumping, Flood damage, Groundwater basins, Groundwater barriers.
Identifiers: *Houston-Galveston area(Texas), Differential compaction.

The Houston-Galveston area of Texas which already has sustained millions of dollars in damage due to land subsidence is threatened with greater loss as this subsidence continues. The conclusions of this paper suggest that the surface faults that interlace the area and control drainage patterns are primarily activated by differential compaction of the underlying aquifer; these faults also appear to be hydrological barriers. The faults compartmentalize land subsidence into several individual basins, thus, pumpage from one fault-bound basin may not adversely affect another. It is urged that such evidence be well considered before future releveling surveys are undertaken. (Eberle-NWWA)
W77-08662

GROUND WATER BUDGET OF THE MOUNTAINOUS REGIONS OF HUNGARY, (IN HUNGARIAN),
Hungarian State Geological Inst., Budapest.
For primary bibliographic entry see Field 2F.
W77-08663

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
For primary bibliographic entry see Field 8G.
W77-08668

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-08670

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 5B.
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 5B.
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.

For primary bibliographic entry see Field 5B.
W77-08680

GEOCHEMISTRY OF THERMAL WATERS FROM VARIOUS GEOTHERMAL PROVINCES OF INDIA,
National Geophysical Research Inst., Hyderabad(India).
For primary bibliographic entry see Field 2K.
W77-08682

TEMPERATURE AND CHEMISM OF GROUND WATERS IN THE WESTERN AREAS OF THE EAST EUROPEAN PLATFORM,
Akademiya Nauk SSSR, Moscow. Interagency Geophysical Committee.
For primary bibliographic entry see Field 2K.
W77-08683

GEOCHEMISTRY AND ORIGIN OF THERMAL WATERS IN POLAND,
Polish Academy of Sciences, Warsaw. Inst. of Geological Science.
For primary bibliographic entry see Field 2K.
W77-08684

THERMAL WATERS IN TAIWAN, A PRELIMINARY STUDY,
Mining Research and Service Organization, Taipei (Taiwan).
C. Chen.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 79-88, 3 fig, 1 tab, 13 ref.

Descriptors: *Geothermal studies, *Geochemistry, Heated water, Hydrothermal studies, Hydrogen ion concentration, *Thermal water.
Identifiers: *Taiwan.

Approximately 80 hot-spring and fumarolic areas in Taiwan are reported with most of them being located in the Miocene, Paleogene, and pre-Tertiary metamorphic terranes. The two explored geothermal fields are Tatun and Tuchang. The Tatun belt is apparently of volcanic origin and the geothermal power potential is estimated to be at least 80-200 MW. Large scale exploitation has been hampered by the corrosion problem rendered by the acid fluid. It is suggested that the Tuchang belt could be another important belt capable of immediate exploitation. The Tuchang field produces sodium bicarbonate water with a pH around 8.5 and temperatures up to 173C. The Tatun field contains acid sulphate chloride water with a pH of about 2 and temperature up to 193C. (See also W77-08677) (Chilton-ORNL)
W77-08685

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 2K.
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
For primary bibliographic entry see Field 5B.
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
For primary bibliographic entry see Field 2K.
W77-08688

STUDIES BY THE DYNAMIC METHOD ON THE REACTION OF ROCK WITH HOT SPRING WATER OF THE TAMAGAWA HOT SPRINGS IN JAPAN,
Toho Univ., Tokyo (Japan). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W77-08689

IMPORTANT GEOTHERMAL SITES IN GREECE, ON THE BASE OF THERMOMINERAL SPRING LAYINGS, AND THE POSSIBILITIES OF THEIR EXPLOITATION AND UTILISATION,
National Technical Univ., Athens (Greece). Institute of Mineral Layings, Science and Applied Geology.
C. Garagouins, and C. Dimitroulias.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 128-134, 20 ref.

Descriptors: *Geothermal studies, *Thermal water, *Heated water, Hydrology, Energy, *Hot springs.
Identifiers: *Greece(Neovolcanic regions).

The neovolcanic regions of Greece are identified. Some thermal springs are found to mix with other waters before reaching the surface and there by lose part of their heat. The study suggests that it would be possible to capt warm water at depth and to obtain high temperatures. The possibilities of energy production from waters ranging from 60-100 C is discussed. (See also W77-08677) (Chilton-ORNL)
W77-08690

TOTAL ENERGY USE IN AN URBAN-AGRICULTURAL POWER PLANT COMPLEX,
Oregon State Univ., Corvallis. Dept. of Soil Science.
For primary bibliographic entry see Field 5G.
W77-08691

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
For primary bibliographic entry see Field 5B.
W77-08706

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1975 TO SPRING 1976,
Geological Survey, Tucson, Ariz. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08732

AVAILABILITY OF GROUND WATER IN THE MIDDLE MERRIMACK RIVER BASIN, CENTRAL AND SOUTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N. H. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08733

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08734

GUIDE FOR DATA COLLECTION TO CALIBRATE A PREDICTIVE DIGITAL GROUND-WATER MODEL OF THE UNCONFINED AQUIFER IN AND NEAR THE CITY OF MODESTO, CALIFORNIA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-08735

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08738

SIMULATIONS OF WATER-LEVEL DRAWDOWNS IN PROPOSED WELL-FIELD AREAS, DADE COUNTY, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
H. Klein.
Open-file report 76-651, September 1976. 14 p, 9 fig, 1 ref.

Descriptors: *Model studies, *Drawdown, *Aquiers, *Pumping, *Florida, Water wells, Networks, Feasibility studies, Analog models, Evaluation, Projections.
Identifiers: Dade County(Fla), *Biscayne aquifer(Fla).

Electrical analog model simulations of hydraulic conditions in the Biscayne aquifer were made at proposed inland well-field sites in Dade County, Florida. Simulated drawdowns of water levels after 7 months of continuous pumping at 50, 100, and 150 million gallons per day were obtained at each site. Simultaneous pumping of each of the sites at 50 million gallons per day showed that after 7 months pumping there would be interference between proposed well fields. (Woodard-USGS)
W77-08739

OUTLINE OF THE WATER RESOURCES OF THE SATUS CREEK BASIN, YAKIMA INDIAN RESERVATION, WASHINGTON,
Geological Survey, Tacoma, Wash. Water Resources Div.
D. Molenaar.
Open-file report 76-808, 1977. 34 p, 20 fig, 23 ref.

Descriptors: *Available water, *Streamflow, *Groundwater resources, *Aquifer characteristics, *Irrigation, *Indian reservations, *Washington, Hydrogeology, Surface-groundwater relationships, Saturated soils, Hydrologic budget, Evaluation, Watershed management.

Identifiers: *Yakima Indian Reservation(Wash), *Satus Creek basin(Wash).

On the Yakima Indian Reservation, Washington, only about 5 percent of the Satus Creek basin--in the relatively flat eastern lowland adjacent to and including part of the Yakima River lowland--is agriculturally developed, mostly through irrigation. Because the basin's streams do not contain adequate water for irrigation, most irrigation is by canal diversion from the adjoining Toppenish Creek basin. Irrigation application of as much as 9.25 acre-feet per acre per year, combined with the presence of poorly drained silt and clay layers in this area, and the natural upward discharge of ground water from deeper aquifers (water-bearing layers), has contributed to a waterlogging problem, which has affected about 10,500 acres, or about 25 percent of the irrigated area. In the upland of the basin, a large average annual base flow of about 30 cubic feet per second in Logy Creek indicates the presence of a potentially highly productive aquifer in young (shallow) basalt lavas underlying the higher western parts of the upland. This aquifer may provide a reservoir from which streamflow may be augmented by groundwater pumping or, alternatively, it may be used as a source of ground water for irrigation of upland areas directly. (Woodard-USGS)
W77-08740

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
M. E. Pabst, and E. D. Jenkins.
Kansas Geological Survey Journal, Lawrence, December 1976. 20 p, 2 fig, 2 plates, 2 tab, 14 ref.

Descriptors: *Groundwater resources, *Withdrawal, *Water utilization, *Water level fluctuations, *Kansas, Irrigation, Drawdown, Hydrologic data, Well data, Aquifers, Data collections.
Identifiers: Northwestern Kansas.

The water level in wells has declined as much as 44 feet (13 meters) since 1950 in areas of greatest development in northwestern Kansas, primarily as a result of groundwater withdrawals for irrigation. During 1950-76, the number of irrigation wells increased from about 100 to 3,050, and annual withdrawals are estimated to have increased from 15,000 to 600,000 acre-feet (18 to 740 cubic hectometers). Most of the water used in northwestern Kansas is withdrawn by wells screened in the Ogallala Formation of Pliocene age. The Ogallala consists primarily of sand and gravel that contains lenses of clay and silt. (Woodard-USGS)
W77-08742

ARTIFICIAL RECHARGE FOR SUBSIDENCE ABATEMENT AT THE NASA-JOHNSON SPACE CENTER, PHASE I,
Geological Survey, Austin, Tex. Water Resources Div.
S. Garza.
Open-file report 77-219, 1977. 82 p, 23 fig, 7 tab, 21 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, *Artificial recharge, *Injection wells, Model studies, Aquifers, Hurricanes, Floods, Feasibility studies, Methodology, Evaluation, *Texas.
Identifiers: *NASA-Johnson Space Center(Tex), Houston area(Tex).

Regional decline of aquifer head due to groundwater withdrawal in the Houston area has caused extensive land-surface subsidence. The NASA-Johnson Space Center (NASA-JSC) in southeastern Harris County, Texas, was about 13 to 19 feet above mean sea level in 1974 and sinking at a rate of more than 0.2 foot per year. NASA-JSC officials, concerned about the hurricane flooding hazard, requested the U.S. Geological Survey to study the feasibility of artificially recharging the aquifers for subsidence abatement. Hydrologic digital models were developed for theoretical determinations of quantities of water needed, under various well-array plans, for artificial recharge of the Chicot and Evangeline aquifers in order to halt the local subsidence at NASA-JSC. The programs for the models were developed for analysis of three-dimensional ground-water flow. Total injection rates of between 2,000 and 14,000 gallons per minute under three general well-array plans were determined for a range of residual clay pore pressures of 10 to 70 feet of hydraulic head. The space distributions of the resultant hydraulic heads, illustrated for injection rates of 3,600 and 8,400 gallons per minute, indicated that, for the same rate, increasing the number and spread of the injection locations reduces the head gradients within NASA-JSC. (Woodard-USGS)
W77-08744

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
J. M. Bettandroff, and S. A. Leake.
Mississippi Research and Development Center, Jackson, 1976. 68 p, 24 fig, 10 tab, 38 ref.

Descriptors: *Water resources, *Surface waters, *Groundwater, *Water quality, *Water utilization, *Mississippi, Hydrologic data, Streamflow, Sediments, Water wells, Aquifer characteristics, Water yield, Water pollution sources, Chemical analysis, Water supply, Water demand.
Identifiers: West-central Mississippi.

Ground water is the major source of industrial and agricultural water supplies in Attala, Holmes, Humphreys, Issaquena, Sharkey, and Yazoo Counties, Miss. A total of 5,416 million gallons per day were used for public and industrial supply in 1975; agricultural use for the year was 45,000 acre-feet. Average runoff contributed by the study area to the river basins is 3,000 million gallons per day. The average flow of the Mississippi River past the area is 360 billion gallons per day. The surface water is chemically suitable for most uses; however, some streams contain relatively high concentrations of iron, large amounts of sediment, or high color. Agricultural chemicals have impaired the quality of the stream and lake system. The fresh-ground-water section is 500 to 3,000 feet thick. The lower Wilcox aquifer, the Meridian-upper Wilcox aquifer, the Sparta aquifer system, and the Cockfield Formation are the major sources of ground-water supplies and are capable of supplying one million gallons per day or more to well fields in most areas. Water is highly mineralized in downdip areas of these aquifers. Iron and low pH cause problems locally in water supplies. The Mississippi River valley alluvial aquifer can supply several million gallons per day to well fields; however, the water is hard and contains excessive iron. (Woodard-USGS)
W77-08748

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08753

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08807

SURFACE-GROUNDWATER INTERACTIONS AND THE CONJUNCTIVE USE OF THE WATER RESOURCES OF THE MULLICA RIVER BASIN, NEW JERSEY,
Rutgers - The State Univ. New Brunswick N. J. Dept. of Civil and Environmental Engineering.
R. Ahmed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 908, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, January 1973. 210 p, 19 figs, 28 tabs, 3 app. 88 ref. OWRT A-025-NJ(8) B-014-NJ(6) and A-025-NJ(8).

Descriptors: *River flow, Subsurface flow, Inflow, *Surface-groundwater relationships, *Aquifers, *Conjunctive use, Streamflow, *New Jersey, Groundwater movement, *Darcys law, *Continuity equation, Computer models.
Identifiers: *Mullica River Basin(NJ).

A fundamental equation describing transient two-dimensional flow through an aquifer was developed using Darcy's law, and the continuity equation. The resulting equation was a nonlinear parabolic partial differential equation. The resulting equation was solved numerically on the digital computer. An Alternating Direction Explicit Technique was employed to solve the flow equation for the head at any point in the basin under consideration and the amount of water exchange between stream and aquifer. The efficiency and accuracy of the digital model were checked by comparing the calculated values against analytical solutions for a homogeneous isotropic aquifer of simple geometry. Results of the comparison were satisfactory. Trend surface analysis was performed on available hydro-geologic data for the groundwater aquifer in the Mullical River Basin, New Jersey. A general linear model was utilized to extrapolate the values of the parameters to any point in the basin. Natural recharge values were obtained from calculated potential recharge values for the Batsto and the Oswego sub-basin. The digital computer model for the groundwater aquifer-stream system was specifically verified for the Batsto and the Oswego sub-basins by comparing the computed and historical return flow to the streams.
W77-08810

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

SOIL AND ROCK STRATA TO TRAP, FILTER AND STORE WATER FOR RURAL DOMESTIC USE,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 3B.
W77-08821

A MATHEMATICAL MODEL STUDY OF FRESH-WATER LENSES,
Aston Univ., Birmingham (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08837

DIGITAL MODEL STUDIES OF STEADY-STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN ALLUVIAL PLAINS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08838

SEISMIC DESIGN OF LIQUID-STORAGE TANKS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-08859

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 2K.
W77-08882

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
T. Ozaki.
Geol Surv Jpn Rep. 249, p 1-54, 1973.

Descriptors: *Groundwater, *Data collection, Water levels, *Water supply, *Pumping, Industrial water, *Water level fluctuations, Artesian wells, Precipitation(Atmospheric).
Identifiers: *Japan.

Records of ground water levels in Japan are presented, and comments are given on the relation between annual fluctuation of ground water level and parameters such as history of development of ground water supply and the annual increase of pumping for industrial activities. A number of types of long-term fluctuations are distinguished. The fluctuation of ground water level is related to natural precipitation and supply from river water to the ground water basin. Ground water levels were found to be gradually lowering due to increased pumping from artesian wells in some areas. When pumping activities were controlled the ground water level was found to rise. Overall ground water levels were found to be slightly lower, suggesting that the problem will increase in the future.--Copyright 1975, Biological Abstracts, Inc.
W77-08904

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
For primary bibliographic entry see Field 5G.
W77-08979

A 'ROUGH CUT' MODEL OF A SOUTH FLORIDA WATER SUPPLY PLAN,
Central and Southern Florida Flood Control District, West Palm Beach.
W. V. Storch.
In Depth Report, Vol 1, No 9, p 1-12, December-January 1973. 3 fig.

Descriptors: *Florida, *Groundwater, *Aquifers, *Groundwater resources, *Water resources, Water table, Water table aquifers, Drought, Water storage, Groundwater movement, Groundwater potential, Groundwater availability, Subsurface waters, Surface waters.

South Florida water plans of the past and present are compared in this study of what a model plan should contain. The Corps of Engineers federal water supply plan of 1968, which sought long-term carryover storage facilities in and around Lake Okeechobee, is explained in detail. For the future, the study recommends greater withdrawal from the Biscayne aquifer, as well as backpumping from the lower east coast into the conservation areas. Storm runoff from the east coast should be directed deep underground. A series of studies examine the feasibility of matching water needs with population growth and environmental factors. The key recommendation is that the storage capability of Lake Okeechobee be raised to 17.5 feet, so as to match the expected increase in the state's population. (Frank-Florida)
W77-08980

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
For primary bibliographic entry see Field 6E.
W77-09011

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
For primary bibliographic entry see Field 5B.
W77-09042

CHARACTER OF SEEPAGE OF PRECIPITATION TO THE WATER TABLE IN THE CENTRAL FOREST STEPPE,
Akademiya Nauk SSSR, Moscow. Institut Geografii.
A. M. Grin, S. I. Yevlakhina, and Yu. V. Kuk.
Soviet Hydrology, Selected Papers No 4, p 267-270, 1975. 4 fig, 2 tab, 6 ref. Translated from Izvestiya Akademii Nauk USSR, Seria Geograficheskaia, No 5, p 70-76, 1975.

Descriptors: *Seepage, *Water table, *Groundwater recharge, Infiltration, Leaching, Forests, Grasslands, Precipitation(Atmospheric), Soil water, Groundwater, Moisture content, Water levels, Wells, Foreign countries, Foreign research, Water wells, Zone of aeration, Soil water movement, Snowmelt, Melt water.
Identifiers: *USSR.

Groundwater recharge by precipitation is of great interest because of its practical significance and great scientific complexity. The nature of water seepage from the soil surface through the aeration zone and to aquifers is insufficiently known in many natural areas. Yet it is known that the solution of many theoretical and practical problems in hydrology and water management depends on how, at what time, and in what way the groundwaters are recharged by precipitation seeping from above. Study of the water regime of soils in the central forest-steppe has been initiated as early as the 1920's. It was found that the soil water reserves are replenished mainly during the snow melt period and partly in autumn. The largest increment in soil moisture occurs during snowmelt, especially when conditions are favorable for meltwater seepage. Such conditions are observed when the soil is frozen to a small depth and there is no ice crust and also when the melting of snow is slow and its water equivalent is high. In such periods, the soil is wetted to a maximum depth. However, even under the most favorable conditions, continuous wetting over an area rarely reaches a depth of 3-5 m, whereas the depth to the water table here is 10 m or more, as a rule. (Sims-ISWS)
W77-09043

SELECTED PROBLEMS IN IDAHO GROUND WATER LAW,
Idaho Univ., Moscow. Coll. of Law.
For primary bibliographic entry see Field 6E.
W77-09049

ARTIFICIAL RECHARGE TO A FRESH-WATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
D. L. Brown, and W. D. Silvey.
Available from the Supt. of Documents, GPO, Washington, DC 20402, Price $1.70. Professional Paper 939, 1977. 53 p, 39 fig, 10 tab, 16 ref.

Descriptors: *Groundwater recharge, *Artificial recharge, *Injection wells, *Brackish water, *Aquifers, Water quality control, Water storage, Test wells, Aquifer characteristics.
Identifiers: *Norfolk(Va), Test drilling.

Fresh water was injected into a brackish-water sand for storage and retrieval. The initial injection rate of 400 gpm decreased to 70 gpm during test 3. The specific capacity of the well decreased also, from 15.4 to 0.93 gpm. Current-meter surveys indicated uniform reduction in hydraulic conductivity of all contributing zones in the aquifer. Hydraulic and chemical data indicate this was caused by dispersion of the interstitial clay upon introduction of the calcium bicarbonate water into the sodium chloride bearing sand aquifer. The clay dispersion also caused particulate rearrangement and clogging of well screen. A pre-flush of 0.2 N calcium chloride solution injected in front of the fresh water at the start of test 4 stabilized the clay. However, it did not reverse the particulate clogging that permanently reduced permeability and caused sanding during redevelopment. Clogging can be prevented by stabilization of the clay using commercially available trivalent aluminum compounds. Test 1 and test 2 showed that 85 percent of the water injected can be recovered, and the water meets U.S. Public Health Standards. Storage of fresh water in a brackish-water aquifer appears feasible provided proper control measures are used. (Woodard-USGS)
W77-09066

ANALOG SIMULATION OF THE GROUND-WATER SYSTEM, YUMA, ARIZONA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09067

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
E. A. Sammel, and D. L. Peterson.
Water-Resources Investigations 76-127 (open-file report), 1976. 137 p, 20 fig, 11 tab.

Descriptors: *Geothermal studies, *Oregon, *Aquifer characteristics, *Water chemistry, *Groundwater, Geochemistry, Geophysics, Heat flow, Hot springs, Basalts, Faults(Geologic).
Identifiers: *Klamath Falls area(Oreg).

Geothermal phenomena in the vicinity of Klamath Falls, Oregon, include hot springs, steam and water wells with temperatures exceeding 100 deg C, and several hundred warmwater wells with temperatures ranging from 20 deg C to 35 deg C. Hot water is confined to three relatively restricted areas located near major fault and fracture zones of the Basin and Range type. The water is produced mostly from Tertiary basalt and volcanic sediments. The hot waters contain less than 1000 mg/liter of dissolved solids and have compositions dominated by sodium and sulfate. Silica concentrations are less than 100 mg/liter, and the minimum estimated reservoir temperature based on silica content is 130 deg C. Cation ratios suggest that actual reservoir temperatures are not much greater than the estimated minimum. The temperature regime in the upper 500-600 meters of rock is dominated by convective transport, and gradients exceed 150 deg C per kilometer at places. Heat flow in the area, however, may be no more than 1.5 - 2 heat-flow units. In the absence of evidence for a shallow intrusive body of hot rock, the geothermal phenomena are attributed to deep circulation of meteoric water. The reservoir may be one of the largest hot-water geothermal systems in the United States. (Woodard-USGS)
W77-09070

REPORT ON PRELIMINARY DATA FOR MADISON LIMESTONE TEST WELL NO. 1, NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROOK COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.

R. K. Blankennagel, W. R. Miller, D. L. Brown, and E. M. Cushing.
Open-file report 77-164, February 1977. 97 p, 8 fig, 3 plates, 5 tab, 1 ref.

Descriptors: *Groundwater resources, *Test wells, *Aquifer characteristics, *Water quality, *Wyoming, Groundwater potential, Borehole geophysics, Stratigraphy, Hydrogeology, Chemical analysis, Regional analysis, Montana, North Dakota, South Dakota, Projections.
Identifiers: *Madison Limestone, *Core analyses.

This report provides the preliminary data for the Madison Limestone test well no. 1 in Crook County, Wyoming, including test-well history, geology of the test well, hydrologic testing, and geochemistry. The test well was drilled to a depth of 4,341 feet to determine the water-resource potential of the Madison Limestone and associated rocks to meet future water needs in a 188,000 sq mi region that includes the coal-rich area of the Northern Great Plains. Drilling and testing were designed to yield a maximum of stratigraphic, structural, geophysical, and hydrologic information. All significant water-bearing units contain relatively freshwater (less than 2,000 mg/liter dissolved solids). Three water-bearing units, which are now cased off, may be potential sources of ground water in the area of the test well. These are the Hulett Sandstone Member of the Sundance Formation, the Minnekahta Limestone, and the upper sandy part of the Minnelusa Formation. (Woodard-USGS)
W77-09072

GEOLOGIC DATA FROM TEST DRILLING IN PALM BEACH COUNTY, FLORIDA SINCE 1970,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09073

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09079

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09081

CHEMICAL AND ISOTOPIC INVESTIGATIONS OF GROUNDWATER IN POTENTIAL GEOTHERMAL AREAS IN HAWAII,
Hawaii Inst. of Geophysics, Honolulu; and Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2K.
W77-09082

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
W. A. Hobba, Jr.
West Virginia Geological and Economic Survey, Morgantown, and the Berkeley County Court, 1976. 21 p, 1 plate, 5 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Water quality, *Surface-groundwater relationships, Hydrologic data, Water table, Water levels, Aquifer characteristics, Chemical analysis, *West Virginia, Potomac River.
Identifiers: *Berkeley County(W Va), Potomac River basin.

Berkeley County, W. Va., is largely underlain by limestone aquifers in which water levels may fluctuate annually as much as 32 feet. In order to prepare maps of the water table and ground-water quality that represent one instant in time, data were collected during a two-week period of dry weather in July and August 1973. The water levels in 350 wells and springs and the discharge of 24 streams were measured. Water-quality analysis showed that specific conductance ranged from 10 to 1400 micromhos. Carbonate hardness ranged from 3 to 700 mg/liter. Nitrate concentration ranged from 0 to 143 mg/liter and chloride concentrations ranged from 3 to 255 mg/liter. As much as 85 percent of streamflfow may be derived from ground water in parts of the county underlain by limestone aquifers. This discharge may be as much as 600,000 gallons per day per square mile. Fifteen wells and springs were sampled after a period of recharge in January 1974. Fecal coliform and fecal streptococci concentrations were as much as 600 and 355 colonies per 100 ml, respectively. Nitrate concentrations in these samples were as much as 10 times higher than the concentrations found in samples collected in July and August. (Woodard-USGS)
W77-09083

STORAGE OF LOW-LEVEL RADIOACTIVE WASTES IN THE GROUND: HYDROGEOLOGIC AND HYDROCHEMICAL FACTORS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5E.
W77-09086

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN AND NEAR GRAND TETON NATIONAL PARK, WYOMING, THROUGH OCTOBER 1976,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09087

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09088

INTEGRAL EQUATION FOR THE DESCRIPTION OF STREAM-AQUIFER INTERACTION,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-09092

4C. Effects On Water Of Man's Non-Water Activities

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forest Resources.
J. A. Lynch, E. S. Corbett, and R. J. Hutnik.
In: Clearcutting in Pennsylvania, the Pennsylvania State University, University Park, Pa., 1975. (Chapter 5: Water Resources p 51-63. 37 ref.

Descriptors: *Clear-cutting, *Water quality, *Water yield, Turbidity, Water temperature, Storm runoff, Peak discharge, Cycling nutrients, Leaching, Water pollution sources, Pennsylvania, Northeast US.

The factors influencing the quality and quantity of water yielded from forested lands are outlined. The effects of clearcutting on stream nutrient concentrations, water temperature, turbidity, water yield, and stormflows are evaluated. Recommendations are made for protecting water resources when using clearcutting as a forestry practice. (Forest Service)
W77-08712

HYDROLOGIC CHANGES AFTER LOGGING IN TWO SMALL OREGON COASTAL WATERSHEDS,
Geological Survey, Portland, Oreg. Water Resources Div.
D. D. Harris.
Available from Branch of Distribution, USGS, 1200 S.Eads St., Arlington, VA 22202, price $0.75. Water-Supply Paper 2037, 1977. 31 p, 16 fig, 11 tab, 36 ref.

Descriptors: *Lumbering, *Clear-cutting, *Environmental effects, *Sediment yield, *Streamflow, *Oregon, Small watersheds, Hydrologic data, Water yield, Flow rates, Sediment transport, Water temperature, Evaluation.
Identifiers: Hydrologic changes, Small coastal watersheds.

Effect of clearcut, cable logging on the hydrologic characteristics of a small coastal stream in Oregon indicate an average 181-percent increase in sediment yield over a 7-year postlogging period. Annual runoff and high-flow volumes increased 19 and 1.1 inches, respectively, after logging in the watershed. Clearcutting in small, spaced patches in another watershed resulted in some increase in water and sediment yields, but the increase was not statistically significant. Average monthly April-October maximum water temperatures increased significantly in the principal stream of both the clearcut and 'patch-cut' watersheds. Hydrologic characteristics of both streams generally appear to be returning to prelogging conditions (1973). (Woodard-USGS)
W77-08746

NETWORK CHARACTERISTICS IN SUBURBANIZING STREAMS,
Iowa Univ., Iowa City. Dept. of Geography.
W. L. Graf.
Water Resources Research, Vol. 13, No. 2, p 459-463, April 1977. 4 fig, 4 tab, 10 ref.

Descriptors: *Drainage, *Networks, *Urbanization, *Iowa, Drainage systems, Drainage effects, Watersheds(Basins), Hydrographs, Channels, Data processing, Analytical techniques, Streamflow, Flash floods, Runoff, Geomorphology, Cities, Hydrology.
Identifiers: *Suburban drainage.

Analysis of hydrologic, geomorphic, and suburbanization data from a small instrumented drainage basin near Iowa City, Iowa, indicated that channel networks are radically altered when

suburban development overtakes a drainage basin. Changes in channel networks are such that the network becomes much more efficient in collecting water quickly, so that lag time and kurtosis of storm hydrographs are altered to produce the familiar flash floods of urban areas. The data showed that network changes are closely associated with lag time, and kurtosis of storm hydrographs and suggested that corrective measures should be concentrated on the internal links of the network. Changes in characteristics of channel networks should be considered in addtion to changes in areas of impervious surfaces when the hydrologic impact of suburbanization is assessed. (Sims-ISWS)
W77-08830

SEASONAL VARIATIONS IN THE IMPACT OF SUBURBAN DEVELOPMENT ON RUNOFF RESPONSE: PETERBOROUGH, ONTARIO,
Trent Univ., Peterborough (Ontario). Dept. of Geography.
C. H. Taylor.
Water Resources Research, Vol. 13, No. 2, p 464-468, April 1977. 1 fig, 1 tab, 11 ref.

Descriptors: *Runoff, *Precipitation(Atmospheric), *Urbanization, *Drainage effects, *Canada, *Seasonal, Rainfall-runoff relationships, Snow, Snowmelt, Cities, Effects, Streamflow, Watersheds(Basins), Stream gages, Rain gages, On-site investigations, Hydrographs, Hydrology, Urban hydrology.
Identifiers: *Peterborough(Ontario).

A small basin in Peterborough, Ontario, was instrumented to investigate the contrasts in runoff response between rural and suburbanized sections of the basin. Data were collected over three seasons (summer, fall, and spring) to evaluate seasonal variations in the rural-urban contrast. Results indicated that the effect of the urban development is felt most strongly in the spring under snowmelt conditions and least strongly in the summer. Urban direct runoff volumes exceed rural volumes by factors of 1.2 for summer rainstorms, 2.3 for fall rainstorms, and 7.5 for spring snowmelt and rain-on-snow events. Urban peak discharges exceed rural peaks for the same seasons by factors of 4.5, 2.4, and 7.1. Direct runoff-rainfall ratios (rainfall and snowmelt in the spring case) are consistent in the rural basin, being 0.05 for the summer, 0.07 for the fall, and 0.06 for the spring. The corresponding ratios in the urban basin are 0.06, 0.16, and 0.76. It is believed that seasonal variations in the rural-urban response ratios are caused mainly by seasonal fluctuations in the extent of the runoff contributing area in the urban basin. (Sims-ISWS)
W77-08831

EFFECT OF AGRICULTURAL AND SILVICULTURAL PRACTICES ON THE RUNOFF FROM DRAINAGE BASINS OF THE NIZHNEDEVITSKAYA HYDROLOGIC STATION,
V. G. Bozhenko.
Soviet Hydrology, Selected Papers, No 4, p 296-299, 1975. 1 fig, 4 tab. Translated from Trudy Gosudarstvennogo Gidrologicheskogo Instituta, No 229, p 162-168, 1975.

Descriptors: *Runoff, *Agriculture, *Forestry, *Effects, Farm management, Forests, Precipitation(Atmospheric), Subsurface flow, Surface runoff, Infiltration, Soil water, Watersheds(Basins), Rivers, Foreign countries, Foreign research, Hydrology.
Identifiers: *USSR.

The Nizhnedevitsk Hydrologic Station is in the central part of the Central Chernozem Region of the European USSR. A combination of agricultural and silvicultural reclamation practices has been carried out systematically in the Central Chernozem Region in the past 20-30 years. As a result, the productivity of agricultural lands has increased. For example, the grain crop yield in the Nizhnedevitsk station area has increased from 11 to 30 centners/hectare. The increase was promoted by a change in the structure of crop rotations and tillage practices. The present level of agricultural and silvicultural reclamation practices, which led to a sharp increase in the productivity of agricultural lands, did not change the annual runoff of rivers in the central part of the Central Chernozem Region, but resulted in a redistribution of the volumes of surface and subsurface flow into rivers. Surface runoff decreased by a factor of nearly 2, while subsurface flow increased by the same value. The change occurred mainly as a result of the conversion of summer-autumn surface runoff to subsurface flow and also because of a slight reduction in the proportion of surface runoff in spring. In the last 10 years, subsurface flow accounted for 70-75% of the annual river runoff volume, i.e., river runoff became more regulated by the subsurface storage of the basins, which must have a beneficial effect on the utilization of river runoff. The water erosion of soils decreases with a reduction of summer-autumn floods. (Sims-ISWS)
W77-08835

MAN'S EFFECT ON THE FISHES OF THE UPPER SHETUCKET RIVER SYSTEM,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09061

FLOOD-PLAIN DELINEATION FOR DIFFICULT RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
P. L. Soule.
Open-file report 76-459, 1976. 184 p, 112 fig, 16 tab, 4 ref.

Descriptors: *Flood plains, *Boundaries(Surfaces), *Urbanization, *Flood control, *Flood profiles, Maps, Flood frequency, Flood recurrence interval, Land management, Planning, Construction.
Identifiers: *Fairfax County(Va), Difficult Run basin.

Water-surface profiles of the 25-year and 100-year floods and maps on which the 25-, 50-, and 100-year flood boundaries are delineated for streams in the Difficult Run basin in Fairfax County, Virginia. The techniques used in the computation of the flood profiles and delineation of flood boundaries are presented. Difficult Run heads at about 500 ft. elevation near the city of Fairfax and discharges into the Potomac River at about 70 feet above mean sea level. Stream channel slopes are fairly steep, the main channel of Difficult Run has an average fall of about 25 feet per mile. Stream channels are well defined with established flood plains covered in most cases with trees and dense brush. Development within the basin has been gradual and mostly residential. In 1965 most of the development was in the area of Fairfax City and the town of Vienna and imperviousness for the basin at that time was computed to be less than 1 percent. Since 1965 considerable additional residential development has taken place within the basin in the Vienna and Reston areas and ultimate development with an overall imperviousness of 30 percent is anticipated with higher percentages of imperviousness near centers of anticipated development. (Woodard-USGS)
W77-09071

GEOLOGIC DATA FROM TEST DRILLING IN PALM BEACH COUNTY, FLORIDA SINCE 1970,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09073

4D. Watershed Protection

THE HYDROLOGY OF A SMALL CATCHMENT BASIN AT SAMARU, NIGERIA: IV: ASSESSMENT OF SOIL EROSION UNDER VARIED LAND MANAGEMENT AND VEGETATION COVER;
Institute for Agricultural Research, Zaria (Nigeria).
J. Kowal.
Samaru Res Bull. 149, p 134-147, 1972.

Descriptors: *Soil erosion, *Land management, *Watershed management, *Surface runoff, *Runoff, Watersheds(Basins), Vegetation effects, Abrasion, Dispersion, Cultivation, Cultivated lands, Terracing.
Identifiers: Nigeria, Samaru, Plant nutrient loss, Nutrient loss.

The results of a field experiment designed to measure surface erosion under various systems of land management and vegetation cover are presented for the period 1965-8. No correlation was found between the amount of annual run-off and the amount of annual soil erosion or plant nutrient loss. This is attributed to a difference in the hydraulic characteristics of run-off flow, to a differential contribution to total erosion by splash and abrasion and to differences in the degree of dispersion brought about by various treatments tested. The average amount of soil lost in erosion from cultivated plots, 200 yards long and laid out at constant gradient of 1:320, ranged from 3.370 + 360 lb to 18,690 + or - 630 lb/acre (3,780 + or - 400 to 20,950 + or - 700 kg ha-1)/yr. Under natural vegetation no loss of soil occurred. The lowest erosion occurred from non-ridged land, averaging between 3,370 + 360 and 3,600 + 380 lb/acre (3,780 + or - 400 and 4,000 + or - 420 kg ha-1)/yr irrespective of treatment cover. Terraces with 3-ft (0.9-m) ridges gave 5.3 times as much soil loss than flat land, while that with alternate ridges tied was 1.5 times greater. The largest soil loss occurred from broadlands with alternately-tied ridges amounting to 1890 + or - 630 lb/acre (20,960 + or - 7C0 kg ha-1)/yr. The total amount of exchangeable and soluble bases lost annually in run-off and eroded soil range from about 14 + or - 1.9 lb/acre (15.7 + or - 2.1 kg ha-1)/yr on cropped flat land and alternately-tied ridges to 29.7 + or - 3.2 lb and 26.3 + or - 2.5 lb/acre (33.3 + or - 3.6 and 29.5 + or - 2.8 kg ha-1) on ridged land and broadlands with alternately-tied ridges, respectively. Annual loss of N ranged from about 7--19 lb/acre (7.8-21.3 kg ha-1) and was approximately proportional to the bases lost in each treatment. Under climate and soil conditions at Samaru growing crops on ridges along terraces still allows a significant amount of soil erosion and nutrient loss. Cultivation on flat terraced land is less damaging.--Copyright 1974, Biological Abstracts, Inc.
W77-08698

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
For primary bibliographic entry see Field 6G.
W77-08721

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
D. E. Funderburg.
Open-file report 77-261, March 1977. 43 p, 23 fig, 4 tab, 7 ref.

Descriptors: *Sediment control, *Reservoirs, *Trap efficiency, *New Mexico, *Thunderstorms, Runoff, Inflow, Retention, Outflow, Sediment

yield, Flash floods, Storm structure, Flood control.
Identifiers: *Bernalillo area(N Mex).

The U.S. Geological Survey, in cooperation with the U.S. Soil Conservation Service, began an investigation of sedimentation of Bernalillo Floodwater Retarding Reservoir No. 1 (Piedra Lisa Arroyo) near Bernalillo, New Mexico in 1956. This investigation was part of a nationwide investigation of the trap efficiency of detention reservoirs. Reservoirs No. 1 is normally a dry reservoir and runoff from the 10.6 sq km drainage area generally occurs from high-intensity summer thundershowers. The mesa area of the drainage basin was treated to prevent erosion and gullying and to retard rapid runoff of rainfall. The land treatment consisted of pits, terraces, seeding, and restricted grazing. The total outflow recorded for the period of record (July 19, 1956 to June 30, 1974) was 133 acre-feet, yielding 1,439 tons of sediment. Over 99 percent of the coarse sediments and a high percentage of the silts and clays were deposited in the reservoir before reaching the outflow pipe. The determined trap efficiency of Reservoir No. 1 was 96 percent for the period of record. (Woodard-USGS)
W77-08741

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
D. C. Curtis, and R. H. McCuen.
Journal of the Water Resources Planning and Management Division, American Society of Civil Engineers, Vol. 103, No. WR1, Proceedings Paper 12938, p 125-140, May 1977. 5 fig, 6 tab, 15 ref, 1 append.

Descriptors: *Urban runoff, *Detention reservoirs, *Model studies, Mathematical models, Erosion, Sedimentation, Sediments, Particle size, Sediment control, Runoff, Storm runoff, Flood routing, Water management(Applied), Urban drainage, Urbanization, Hydrology.
Identifiers: *Detention basins.

In addition to increased flood runoff, urban development has caused a significant increase in sediment loads in streams. While many means of sediment and runoff control have been proposed, stormwater detention has been shown to be one of the more cost efficient means. Because detention has been shown to be one of the more cost efficient means. Because detention facilities have not been used extensively in the past, a data base is not available for determining the effect of design factors on sediment trap efficiency and runoff control characteristics. A mathematical model, which includes erosion, sedimentation, and detention facility components, was developed from principles of hydraulics and classical settling mechanic. The model was used to examine the effecrt of : (1) detention basin location; (2) soil particle size distribution; (3) basin depth; (4) initial storage, and (5) orifice diameter. An understanding of the relative importance of these factors may lead to better design of stormwater detention facilities. (Sims-ISWS)
W77-08841

PERFORMANCE CHARACTERISTICS OF A GRASSED-WATERWAY TRANSITION,
Agricultural Research Service, Stillwater, Okla. Water Conservation Structures Lab.
W. O. Ree.
ARS-S-158, February 1977. 11 p, 14 fig, 3 tab, 1 ref.

Descriptors: *Channel flow, *Erosion control, *Grassed waterways, *Transition flow, Hydraulic jump, Flow, Equations, Profiles, Vegetation, Vegetation effects.
Identifiers: *Bermuda grass.

The report described the performance of a channel transition at the end of a grassed waterway during 11 test flows ranging from 0.83 to 145 cu ft/s to determine the ability of the transition to reduce velocity from supercritical to subcritical without erosion. The transition performed satisfactorily and suffered no erosion or cover loss from the flows. The good performance was attributed to a design that incorporates a gradual convergence of the conjugate depths, thus limiting hydraulic jump to a nondestructive minimum. Maintaining a dense, uniform bermudagrass cover also contributed to the success of the transition. (Bhowmik-ISWS)
W77-08849

PRESENT-DAY SLUMPING AND EROSION PHENOMENA ON IRRIGATED LANDS (EXEMPLIFIED BY SOUTHEASTERN CISCAUCASIA), (IN RUSSIAN),
Industrial Research Inst. of Engineering, Survey and Construction, Stavropol (USSR).
For primary bibliographic entry see Field 2J.
W77-08885

AN ASSESSMENT OF SNOWPACK DEPLETION-SURFACE RUNOFF RELATIONSHIPS ON FORESTED WATERSHEDS,
Arizona Univ., Tucson. Dept. of Watershed Management.
For primary bibliographic entry see Field 3B.
W77-08933

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-08936

DESIGNING FOR SEDIMENT TRANSPORT,
Army Engineer District, Kansas City, Mo.
W. M. Linder.
Water Spectrum, Vol 8, No 1, p 36-43 (Spring-Summer 1976). 3 map, 10 photo.

Descriptors: *Sediment transport, *Design criteria, *Flood control, *Channel erosion, Sediment control, Streams, Rivers, Decision making, Meanders, Berms, Drawdown, Levees, Alluvial faus, Damage, Environmental effects, Equilibrium, Suspended loads, Slopes, Projects.

Stream channelization is frequently employed without consideration of sediment transport characteristics of the stream, or of the extent to which the stream's natural balance will be disturbed. In the past, many problems associated with flood control, drainage, and navigation have been solved by modification of the river channels without giving equal thought to the sediment being transported by the water flowing in those channels. This has led to errors in the planning and design of channel modification projects. In many instances the objectives of the projects have been adequately met, but in others there have been adverse effects. Many acres of fertile land have been lost as the streams widened and deepened. Bridges have been damaged or destroyed during major runoffs. Erosion and sedimentation damage are the critical adverse effects. Techniques should be employed which consider sediment transport characteristics and stream equilibrium. In this way, the reactions of a stream to manmade changes can be minimized. Some of the techniques that should be considered are: (1) composite channel designs; (2) extensive use of levees; (3) grade control structures. The ultimate cost resulting from adverse effects of traditional channel modification is greater than the cost of a design that recognizes the influence of sediment transport. (Martin-Florida)
W77-08962

NATURAL STREAM TEMPERATURE VARIATIONS IN A CATCHMENT,
Environment Protection Authority, Victoria (Australia).
For primary bibliographic entry see Field 5B.
W77-09039

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

BITUMINOID FORMATION IN THE MUD SEDIMENTS OF DOMESTIC SEWAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
V. E. Sinel'Nikov.
Gidrobiol Zh. 9(5), p 12-20, 1973.

Descriptors: *Pollutant identification, *Spectroscopy, Infrared radiation, *Bottom sediments, *Sewage, Domestic wastes, Organic compounds, Fats, Oil, Muds, Luminescence.
Identifiers: *Bituminoids.

By using IR-spectroscopy and studying the luminescent characteristics of substances isolated from the chloroform fraction of domestic sewage bottom sediments, a possible transformation of fats and oils into high molecular weight compounds (bituminoids) is shown. The content of chloroform-soluble substances in the mud was 10% of the whole organic substance determined from losses during calcination. Bituminoids constituted from 25-50% of the whole chloroform-soluble substance. The bituminoid content in the exprimental was 2-10% of the fat applied.--Copyright 1975, Biological Abstracts, Inc.
W77-08618

HIGH SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF COBALAMIN PRODUCTIVITY AND DISTRIBUTION IN ACTIVATED SEWAGE SLUDGE TREATMENT,
Clark Univ., Worcester, Mass.
R. A. Beck.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-6014. Ph.D. Thesis, 1976. 107 p.

Descriptors: *Pollutant identification, *Chromatography, *Activated sludge, Analysis, Filtration, Separation techniques, Analytical techniques, *Sludge treatment, *Waste water treatment, Chemical analysis.
Identifiers: Cobalamins, Benzyl alcohol extraction.

A high speed liquid chromatographic technique was developed for the determination of 1-10 micrograms of total extractable cobalamins from activated sludge. Cobalamins are extracted by benzyl alcohol; spectrophotometrically interfering substances are removed by combined gel filtration and chromatography; trace extracts are concentrated by lyophilization; and total extractable cobalamins are quantified by high speed liquid chromatography. The annual productivity of cobalamins was found to average 1,87-27.08 micrograms/gram of dry sludge weight. Increases of this substance paralled increased environmental temperatures and diminished dissolved oxygen levels. Cobalamin levels were found to be 9.75 micrograms/gram in secondary stage activated sludge, 3.79 micrograms/gram in primary sludge and 4.75 micrograms.gram in tertiary sludge. (Collins-FIRL)
W77-08621

MUSSELS (MYTILUS SP.) AS AN INDICATOR OF LEAD POLLUTION,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5C.
W77-08693

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-08710

AVAILABILITY OF GROUND WATER IN THE MIDDLE MERRIMACK RIVER BASIN, CENTRAL AND SOUTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N. H. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08733

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08738

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08748

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-08753

THE DEVELOPMENT OF A TEST FOR THE POTABILITY OF WATER TREATED BY A DIRECT REUSE SYSTEM,
Cincinnati Univ., Ohio. Coll. of Medicine.
R. T. Christian, C. S. Clark, T. E. Cody, S. Witherup, and P. S. Gartside.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-025 143, Price codes: A09 in paper copy, A01 in microfiche. Report to Army Medical Research and Development Command, Washington, D.C. Report No. 8, June 1976. 181 p, 72 tab, 25 fig.

Descriptors: *Public health, *Domestic water, *Potable water, Domestic wastes, Pathogenic bacteria, Waste disposal, Waste treatment, Waste water treatment, Waste water disposal, Hospitals, Toxins, Human disease methodology, Physiology, Biochemistry, Laboratory tests, *Bioassay, *Toxicity, *Water reuse, Pollutant identification.
Identifiers: *Toxic substances, *Hospital wastewater reuse, Human health problems, *Mammalian cell culture, Hydroquinone, 2 4-dinitrophenylhydrazine, 1 3-dinitrobenzene, *Behavioral toxicology.

The objective of this contract is to develop an assay system to determine th presence of toxic substances in drinking water produced from a direct hospital wastewater reuse system (MUST). A biologically-based test system was chosen because it was potentially a non-specific indicator of the presence of toxins and it is relevant to identification of human health problems. Mammalian cells are cultured in vitro in a growth medium that employs the water under investigation as the solvent. The effect of the drinking water sample on the cell culture is evaluated by comparing cell growth in the test media with growth in control medium made with distilled water as the solvent. The primary aim of this contract in the second year is validation of the toxicity assay through comparison of the response of the assay system to graduated concentrations of known compounds with animal toxicological responses to the same compounds. Hydroquinone, 2,4-dinitrophenylhydrazine, and 1,3-dinitrobenzene dose-response data for animals and mammalian cells are presented. Although emphasis in the animal studies has been on classical toxicological methods, a limited amount of behavioral toxicology has also been carried out. (Katz)
W77-08758

A PNEUMATIC DOSING APPARATUS FOR FLOW-THROUGH BIOASSAYS,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Biology.
A. D. Smith, J. R. Butler, and G. W. Ozburn.
Water Research, Vol 11, p 347-349, 1977. 3 fig, 3 ref.

Descriptors: *Bioassays, *Methodology, *Equipment, *Laboratory equipment, *Toxins, *Design, *Lethal limit, Laboratory tests, Technology.
Identifiers: *Pneumatic dosing apparatus, *Flow-through systems.

A multichannel pneumatic injector, when used with an equal-volume dilutor, possesses several advantages over the mechanical approach to toxicant dosing. The system is reliable and highly versatile, capable of maintaining an unlimited range of toxicant levels in flow-through bioassays. Use of a single toxicant concentration eliminates the necessity of preparing several stock solutions. Automatic reloading of the injector syringes reduces maintenance. (Katz)
W77-08763

TOXICITY TO FISH OF FLAME RETARDANT FABRICS IMMERSED IN THEIR WATER. PART I,
Cornell Univ., Ithaca, N.Y., Dept. of Veterinary Pathology.
For primary bibliographic entry see Field 5C.
W77-08765

THE RESIDUAL OXYGEN BIOASSAY: A RAPID PROCEDURE TO PREDICT EFFLUENT TOXICITY TO RAINBOW TROUT,
E. V. S. Consultants Ltd., Coquitlam, (British Columbia).
G. A. Vigers, and A. W. Maynard.
Water Research, Vol 11, p 343-346, 1977. 1 tab, 3 fig, 12 ref.

Descriptors: *Bioassay, *Testing, *Analytical techniques, *Forecasting, *Rainbow trout, *Toxicity, *Oxygen, *Lethal limit, *Respiration, *Toxicity, *Water quality, *Bioindicators, Laboratory tests, Fish physiology, Oxygen demand, Industrial wastes, Pulp wastes.
Identifiers: *Residual oxygen bioassay, Sodium pentachlorophenate, Kraft pulp mill bleach effluent, Chloralkali plant waste.

A rapid bioassay procedure is described which for the toxic effluents tested, is sensitive to concentration in the 96-h LC50 range. The procedure requires less than eight hours to complete and is based on the consumption of available oxygen by fish in sealed containers. The procedure is evaluated using sodium pentachlorophenate, 3 kraft pulp mill bleach plant effluents and a chloralkali plant waste. The threshold concentrations obtained from the rapid procedure were directly comparable to 96-h LC50 values obtained by standard methods. For replicate tests with sodium pentachlorophenate, no significant difference between means of data obtained by the two bioassay procedures could be demonstrated. (Katz)
W77-08766

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 7C.
W77-08767

THERMAL ACCLIMATION, UPPER TEMPERATURE TOLERANCE, AND PREFERRED TEMPERATURE OF JUVENILE YELLOWTAIL SNAPPERS, OCVURUS CHRVSURUS (BLOCH) (PISCES: LUTJANIDAE),
Auburn Univ., Ala., Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08769

LABORATORY METHODS FOR DETERMINING TEMPERATURE PREFERENCE,
Wilfrid Laurier Univ., Waterloo(Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08770

METHOD FOR DETERMINING ACUTE TOXICITY OF AN ACID WASTE AND LIMITING PERMISSIBLE CONCENTRATION AT BOUNDARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltham, Mass.
For primary bibliographic entry see Field 5C.
W77-08771

A STUDY OF HEAVY METALS IN LAKE ABBAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
A. E. Klein.
Water Research, Vol. 11, p. 323-325, 1977. 2 tab., 1 fig., 12 ref.

Descriptors: *Heavy metals, *Mercury, Africa, *Arsenic compounds, *Public health, Hotsprings, *Diseases, *Parasitism, On-site investigations, Water quality, *Human diseases, Human pathology, Pollutant identification.
Identifiers: *Non-parasitic elephantiasis, *Lake Abbaya(Ethiopia), *Mercury poisoning chronic symptoms.

Samples of surface water from Lake Abbaya, Ethiopia, and from nearby hot springs, have been analysed for heavy metals and other constituents. Significant levels of mercury and arsenic were observed. These findings may be relevant to the high incidence of non-parasitic elephantiasis in the immediate vicinity of the lake. (Katz)
W77-08774

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
S. S. Sandhu.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p. 373-378, 1977. 1 tab., 11 ref.

Descriptors: *Defoliants, *Absorption, *Path of pollutants, *Fishkill, *Herbicides, *Catfish, *Pesticide residues, *Pollutant identification,

*Arsenicals(Pesticides), Toxicity, Pesticides, Water pollution, Agricultural chemicals, Arsenic compounds, Water pollution sources, Agriculture weed control, Public health, Arsenic compounds.
Identifiers: *Bioaccumulation, *Arsenic.

Careless aerial spraying of a cotton field for weed control and defoliation caused the contamination of an adjacent reservoir with the herbicide. Dead catfish, resulting from exposure to the herbicide were found to contain high levels of arsenic (5.09 ppm in fish muscle tissue) suggesting this to be the cause of death. Seven weeks after the exposure, catfish from the reservoir were found to contain 12.38 ppm arsenic in muscle tissue, indicating bioaccumulation of the substance by surviving fish. Water arsenic levels fell from 2.50 ppm to 1.91 ppm after seven weeks. (Katz)
W77-08775

DEVELOPMENT OF A BLOOD SUGAR BIOASSAY FOR RAPIDLY MEASURING STRESSFUL LEVELS OF PULPMILL EFFLUENT TO SALMONID FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
D. J. McLeay.
Journal of the Fisheries Research Board of Canada, Vol 34, p 477-485, 1977. 2 tab, 4 fig, 29 ref.

Descriptors: *Bioassay, *Water pollution effects, FIsh physiology, Biochemistry, Laboratory tests, Rainbow trout, Salmon, Juvenile fish, *Industrial wastes, *Pulp wastes, *Pulp and paper industries, Methodology, Aquaria, Lethal limit.
Identifiers: *Coho salmon, *Blood sugar levels, *Glucose, *Pulpmill effluent, *Blood sugar bioassay, *Bleached kraft mill effluent, Glucose levels, Liver glycogen reserves.

The hyperglycemic stress response of fish was evaluated for use as a rapid test for assessing stressful levels of pulpmill effluents (BKME). Plasma glucose levels in juvenile coho salmon (Oncorhynchus kisutch) were elevated within 0.5 h following transfer from the holding tank to aquaria containing either fresh water or BKME, peaking at 3-6 h and returning to near-basal levels at 24 h. Acclimation of coho to aquaria for 24, 48, 72, or 96 h prior to addition of effluent resulted in marked increases in glucose levels attributable to BKME. Significant responses to effluent were found with exposures of 3-10 h, whereas levels were not increased with exposures of 2 h or less. Plasma glucose levels increased progressively with increasing effluent concentrations. Threshold effect (EC50) values varied from 0.04 to 0.16 of the 96-h LC50 values. The response to BKME treated previously by the activated sludge process or by foam separation was diminished or absent altogether. Juvenile rainbow trout (Salmo gairdneri) and coho displayed a hyperglycemic response with 4-, 6-, or 8-h exposure to an identical effluent concentration, although the magnitude of response of rainbow was less in each instance. (Katz)
W77-08779

ACID MINE DRAINAGE (AMD) AND ITS IMPACT ON A SMALL VIRGINIA STREAM,
Virginia Polytechnic Inst. State Univ., Blacksburg. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5C.
W77-08784

EFFECTS OF SUBLETHAL CONCENTRATIONS OF THE HERBICIDE ATRAZIN ON GROWTH AND REPRODUCTION OF DAPHNIA PULEX,
Freiburg Univ. (West Germany). Limnologisches Institut.
For primary bibliographic entry see Field 5C.
W77-08786

THE USE OF ION EXCHANGE METHODS TO DETERMINE TRACE ELEMENTS IN NATURAL WATERS: IV. URANIUM, COBALT AND CADMIUM, (IN GERMAN),
Vienna Univ. (Austria). Analytisches Institut.
J. Korkisch, and L. Goedl.
Talanta. 21(10), p 1035-1046, 1974.

Descriptors: *Ion exchange, *Trace elements, *Surface waters, *Anion exchange, *Separation techniques, *Cobalt, *Cadmium, Spectrophotometry, Analytical techniques, Water chemistry, Resins, Fluorometry, *Pollutant identification.
Identifiers: Austria, *Uranium.

A method is described for separating and determining by spectrofluorimetric or spectrophotometric measurement, traces of U, Co and Cd at ppm levels in natural waters. The sample is acidified with HCl, filtered, and after addition of ascorbic acid and potassium thiocyanate, passed through a column of Dowex 1- x 8 anion-ex-change resin in the thiocyanate form. The 3 ions are concentrated on the resin as thiocyanate complexes, being at the same time separated from most of the other ions present in the sample. Elution with a tetrahydrofuran-methylglycol-HCl mixture removes other interfering ions, then 6M HCl strips the Co, 1M HCl the U, and 2M HNO3 the Cd. Data are presented for concentrations of U (0.01-5 ppm), Co(0.04-1.9 ppm) and Cd (0.04-0.06 ppm) in a large number of water sources in Austria. (See also W76-07410, W76-07409 and W76-07408)--Copyright (c) 1975, Biological Abstracts, Inc.
W77-08787

A COMPARISON OF METHODS OF HYDROCARBON ANALYSIS OF MARINE BIOTA,
Alaska Univ., College. Inst. of Marine Science.
R. L. Gritz, and D. G. Shaw.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 4, p. 408-415, April 1977. 4 tab., 8 ref.

Descriptors: *Methodology, *Analytical techniques, *Pollutant identification, *Chemical analysis, *Organic compounds, *Biota, Chromatography, Laboratory tests, Testing procedures, Marine life.
Identifiers: *Soxhlet extraction, *Saponification.

The efficiency of currently used methods of hydrocarbon analysis are compared. Butter calm (Saxidomus gigantea) was used for the analysis in its natural state and spiked with a mixture of aliphatic and aromatic hydrocarbons. The methods that were compared were Soxhlet Extraction followed by saponification and extraction by alkaline digestion (direct saponification). For the latter extraction procedure, the effectiveness of two and 24 hour reaction times was compared. Each of the extracts was subjected to column chromatography using fully activated and partially deactivated sorbents. The best test procedures was found to be 24 hour saponification and column chromatography on partially deactivated columns. Soxhlet extraction and direct two hour saponification failed to remove all of the esters. The partially deactivated column was preferred because it prevented the possibility of alkene isomerization. (Katz)
W77-08789

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Ishio, J. C. Chen, and T. YAno.
Bulletin of the Japanese Society Scientific Fisheries Vol. 43, No. 3, p. 277-288, 1977 9 fig., 26 ref.

Descriptors: *Algae, Phytoplankton, *Marine algae, Marine plants, *Biochemistry, Bioassay, Laboratory tests, Methodology, *Algicides, Nutrients, Pathology, Public health, Bioindicators, Pollutant identification.
Identifiers: *Carcinogens, Marine catenate dinoflagellates, *Polykrikos, Carcinogen detector, *Gyrodinium.

A marine catenate dinoflagellate having been tentatively applied for detecting carcinogens has been regarded to be Polykrikos schwartzi Butschli. However, this species does not belong to the genus Polykrikos for reasons that is devoid of both syncytium cell structure and nematocysts, but possesses both chloroplasts and phagocytes. This dinoflagellate is now concluded to belong to the genus Gyrodinium from the theca having both blisters and cortical vesicles, plastids very similar to those of Gyrodinium cohnii and the girdle displacement of 0.23 clearly exceeding the upper limit of that of Gymnodinium. (Katz)
W77-08795

METHOXYCHLOR RESIDUE STUDIES IN CAGED AND WILD FISH FROM THE ATHABASCA RIVER, ALBERTA, FOLLOWING A SINGLE APPLICATION OF BLACKFLY LARVICIDE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W77-08797

EXPERIMENTAL STUDY OF MULTI-CATION DIFFUSION IN AN ARTIFICAL QUARTZ SANDSTONE,
Louisiana State Univ., Baton Rouge. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08811

ELECTROCHEMICAL DETERMINATIONS OF TRACE QUANTITIES OF PHOSPHATE AND NITRATE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
Gary L. Lundquist.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 898, Price codes: A07 in paper copy, A01 in microfiche. PhD Thesis, July 1975. 112 p, 27 fig, 7 tab, 78 ref. OWRT A-041-ILL(4). 14-31-0001-3213.

Descriptors: *Phosphates, *Nitrates, Trace elements, *Electrodes, Electrochemistry, *Volumetric analysis, *Membranes, *Pollutant identification, Cation exchange, Analytical techniques.
Identifiers: *Electrochemistrical stripping.

A method for the determination of phosphate based upon the cathodic chronopotentiometric stripping of an electrochemically deposited cupric phosphate salt film from a copper electrode has been developed. The oxidation state of copper in the salt film was determined by constant current coulometry at a copper-coated platinum electrode. The relative solubilities of the HPO42- and H2PO4- salts were investigated by short-time scale cyclic chronopotentiometry at pH 6.0. Linear working curves over single orders-of-magnitude down to 20 ppb phosphate have been obtained. The cathodic stripping determination of phosphate at a mercury electrode was also evaluated. A method for the determination of trace quantities of nitrate was successfully developed. The determination is based upon the voltammetric reduction of nitrate in the presence of excess lanthanum at a stationary mercury drop electrode. Working curves are linear over two orders-of-magnitude with a detection limit of 60 ppb nitrate. When the method is used in conjunction with a small volume anion exchange membrane isolated cell, the detection limit is lowered to 6.2 ppb. The effect of contact time and volume of a 1.0 x 10-6M NO3- solution was also determined. The effect of sample ionic strength on the rate of transfer of NO3-

through the membrane was studied by adding various concentrations of KCl to the samples. (Cox-Illinois)
W77-08817

THE USE AND MISUSE OF PURE WATER PVT PROPERTIES FOR LAKE WATERS,
Rosenstiel School of Marine and Atmospheric Science, Miami, Fla.
For primary bibliographic entry see Field 2H.
W77-08840

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
For primary bibliographic entry see Field 5B.
W77-08852

SYSTEMATIC IDENTIFICATION OF DO-BOD MODEL STRUCTURE,
Cambridge Univ. (England). Control Div.
For primary bibliographic entry see Field 5B.
W77-08866

EFFECTS OF TEMPERATURE AND KELTHANE ON GRASS SHRIMP,
California Univ., Davis. Water Science and Engineering Section.
For primary bibliographic entry see Field 5C.
W77-08874

MOLYBDENUM CONTENT IN THE SUBSURFACE WATERS OF THE VINNITSA OBLAST, (IN RUSSIAN),
Vinnitskii Meditsinskii Institut (USSR).
For primary bibliographic entry see Field 2K.
W77-08882

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
J. W. Frankenfeld, and W. Schulz.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 883, Price codes: A10 in paper copy, A01 in microfiche. U.S. Coast Guard Research and Development Report No. CG-D-107-75, June 1974. 206 p, 107 fig, 23 tab, 37 ref, 5 append. DOT-CG-23035.

Descriptors: *Oil pollution, *Oil spills, *Water pollution sources, *Pollutant identification, Environmental effects, Analytical techniques, Chromatography.
Identifiers: *Outer Continental Shelf.

A study was undertaken to develop a rapid, efficient method for identifying the source of spilled oil. Fifty-seven different petroleum products were weathered under controlled conditions in laboratory simulators. Samples were taken periodically and examined by a variety of analytical techniques. The analytical methods were graded on their abilities to classify petroleum products as to generic type and to identify the actural source of the spilled oil. Four types of analyses were identified as being especially useful: thin-layer chromatography, infrared fingerprinting, gas chromatographic fingerprinting and liquid-liquid chromatography. The application of these techniques is discussed in detail and examples are given. By use of a combination of these four techniques all oils studied in this project could be uniquely identified. (Sinha-OEIS)
W77-08901

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W77-08903

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
R. O. Barnes, K. K. Bertine, and E. D. Goldberg.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-023 364, Price codes: A02 in paper copy, A01 in microfiche. Reprint, April 1976. Reprinted from: Limnology and Oceanography, Vol 20, No 6, p 962-970, November 1975. 2 fig, 3 tab, 23 ref. N00014-69-A-200-6049.

Descriptors: *Nitrogen compounds, *Argon, *Sediment-water interfaces, *Resources development, *Baseline studies, *Environmental effects, *Nitrification, *Denitrification, Geochemistry, *California.
Identifiers: *Outer Continental Shelf, Molecular nitrogen, Sulfate reduction, Interstitial water, Southern California.

The first quantitative observations of dissolved molecular nitrogen (N2) in deep-sea sedimentary pore waters show increases of up to 17% above adjacent bottom water values. The N2 : Ar concentration ratio similarly increases. This increase is greater than expected from reduction of seawater nitrate in the sediment. A mechanism is suggested in which ammonia, derived from nitrogen-containing organic matter is converted to N2 through a nitrite intermediate under conditions of low oxygen tension. Ammonia is not converted to N2 in anoxic sediments that are undergoing sulfate reduction even though N2 is the thermodynamically stable species. (Sinha-OEIS)
W77-08907

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5G.
W77-08910

BENTHIC MACROINVERTEBRATES AS INDEXES OF WATER QUALITY IN THE SCIOTO RIVER BASIN, OHIO,
Akron University, Akron, Ohio, Department of Biology.
J. H. Olive, and K. R. Smith.
Available from the National Technical Information Service, Springfield, VA 22161, as PB-269 013, Price codes: A07 in paper copy, A01 in microfiche. Bulletin of the Ohio Biological Survey, New Series, Vol 5, No. 2, 1975. 124 p, 20 fig, 23 tab, 53 ref. OWRT B-008-OHIO(2).

Descriptors: *Benthos, *Invertebrates, *Bioindicators, *Ohio, Water quality, Water pollution, *Pollutant identification, Biological communities, Chlorides, Water temperature, Dissolved oxygen, Phosphates, Sulfates, Hardness(Water), Hydrogen ion concentration, *Organic wastes, Sediments.
Identifiers: *Scioto River basin(Ohio).

The results are presented of an evaluation of water quality in the Scioto River system based on the composition and structure of benthic macroinvertebrates communities. Benthic macroinvertebrates from natural substrates were analyzed at 76 locations on the main river channel and on major tributaries during 1967, 1968, and 1969. Water temperature and the concentration of total alkalinity, chloride, total hardness, dissolved oxygen, total inorganic phosphate, sulfate, and hydrogen ions (pH) were determined at each location. Inadequately treated and untreated organic wastes from municipal sewage treatment facilities and sediments from eroding soils were the most common pollutants in the Scioto River Basin. Benthic invertebrate communities were indicative of relatively high quality water at 26 locations; of moderately polluted water at 38 locations; and of heavily polluted water at 12 locations. In heavily polluted areas benthic invertebrate communities usually consisted of more than 80 percent organic pollution-tolerant organisms and had H' values less than 1.0. At least one high-quality area was observed on each stream investigated, usually in the headwater region. The most heavily polluted areas in the Scioto River basin were located below Marion on the Little Scioto River, throughout most of Little Walnut Creek, in mostsections of the Scioto River between Columbus and Portsmouth, and in the north Scioto River just below the mouth of the Little Scioto River.
W77-08925

MINIMUM OXYGEN LEVELS SURVIVED BY STREAM INVERTEBRATES,
Virginia Commission of Game and Inland Fisheries, (Richmond).
For primary bibliographic entry see Field 5C.
W77-08926

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08939

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
W. M. Shackelford, and L. H. Keith.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 470, Price codes: A99 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Monitoring Series, EPA-600/4-76-062, Dec. 1976. 617 p, 6 tab, 5 ref.

Descriptors: *Organic compounds, *Organic wastes, Organic pesticides, *Industrial wastes, Industrial water, *Water pollution sources, Path of pollutants, Analytical methods, Laboratory tests, Methodology, Frequency analysis, *Water quality, Geographical regions, Chemical wastes, *Data collections, *Data storage and retrieval, *Pollutant identification.
Identifiers: Contaminants, *Chemical compounds, Geographical distribution, Computerized list, *Frequency of occurrence(Wastes).

This study was initiated for the purpose of compiling a list of all organic compounds that have been found in water. This report contains the names of compounds found, their location or a reference to a published study, the type of water in which they are found, and the date of sampling or report generation. About 5700 entries are in this list at present. Among them are 1259 different compounds that have been found in one or more of 33 different water types. Tables in the text include lists of the data file sorted by compound name, location or reference, and water type. Also included are tables that summarize the frequency of occurrence of each compound, location or reference, and water type. No attempt has been made to include data from studies that include only analysis for specific compounds. The list is meant to include, however, all survey-type analyses of water samples. (Katz)
W77-08944

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

A FLUORESCENCE IMMUNOASSAY TECHNIQUE FOR DETECTING ORGANIC ENVIRONMENTAL CONTAMINANTS,
IRT Corp., San Diego, Calif.
H. R. Lukens, C. B. Williams, S. A. Levison, W. B. Dandliker, and D. Muryama.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 397, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Health Effects Research Series, Report EPA 650/1-75/004, May 1975. 61 p, 1 tab, 8 fig, 13 ref.

Descriptors: *Methodology, Laboratory techniques, *Laboratory analysis, *Organic compounds, *Public health environmental control, *Pollutant identification, Fungicides, Bioassay, Organic wastes, *Fluorescence.
Identifiers: Polarization, *Immunoassay, *Organic contaminants, 2-aminobenzimidazole, *Benzimidazole, Fluorescein.

This report describes the development and successful demonstration of an immunological assay for the detection of low molecular weight organic contaminants of environmental concern. The specific technique described is a fluorescence polarization immunoassay, the theory of which is presented. The preparation of the two required reagents, namely a fluorescent conjugate of the contaminant of interest, together with an antibody to the contaminant, is described in detail. The specific contaminant chosen for this study was 2-aminobenzimidazole (MW = 133), a metabolite of certain fungicide agents used in agriculture. The particular fluorescent mostly chosen to form the conjugate with the 2-aminobenzimidazole was fluorescein. A successful demonstration of the assay has been accomplished, and a detection sensitivity in the sub-nanogram/ml range obtained. A high degree of specificity of the antibody for the hapten has been demonstrated, and a successful quantitative recovery from an unknown solution has been obtained. (Katz)
W77-08947

TOXICITY OF FOUR PESTICIDES TO WATER FLEAS AND FATHEAD MINNOWS,
EG and G, Bionomics, Wareham, Mass.
For primary bibliographic entry see Field 5C.
W77-08948

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
For primary bibliographic entry see Field 5G.
W77-08953

CHEMICAL CHARACTER OF HEADWATER STREAMS IN VERMONT AND NEW HAMPSHIRE,
Dartmouth Coll., Hanover, N.H.
For primary bibliographic entry see Field 2K.
W77-09027

TRANSJOEN, A GROUNDWATER INFLUENCED LAKE WITH SPECIAL REDOX AND SULPHATE CONDITIONS,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 2H.
W77-09031

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
D. E. Anderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 108, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 61 p, 16 fig, 7 tab, 28 ref, 2 append. OWRT C-4145-(No. 9060)(2).

Descriptors: *Washington, *Idaho, Sediments, *Lakes, *Lake sediments, Carbon, Phosphorus, Manganese, Nitrogen, Pollutant identification, Water pollution.
Identifiers: Total organic carbon, Nitrate nitrogen, Silver Lake, Coeur d'Alene Lake, Liberty Lake, Williams Lake, Capital Lake.

Sediment cores were obtained from Coeur d'Alene, Liberty, Williams, Silver and Capital Lakes in the Washington-Idaho region. A procedure was developed to analyze the total organic carbon (TOC) of sediment using the Oceanographic International Corporation (OIC) carbon analyzer. Suitable computer techniques were employed to determine the non-linear standard curves and interpolation of TOC values. Experiments involving changes in reagent amounts, purging times, and oxidation times showed the newly developed procedure for determining TOC in sediment to be valid. Total phosphorus (T-P), manganese (Mn), and nitrate nitrogen (NO3-N) concentrations of these same sediments were analyzed and compared. No clear cut distribution patterns in chemical data were found among the lakes' sediments. Total organic carbon values were highest in Liberty Lake sediments. Total phosphorus, Mn, and NO3-N values were highest in Coeur d'Alene Lake sediments. In fact, TOC and T-P measurements in this investigation do not appear to be a precise indicator of a lake's tropic status. Manganese has been found to be a controlling factor in phosphorus sedimentation in other studies. However, this did not appear to be the case in this investigation.
W77-09065

LIMNOLOGICAL INVESTIGATION OF SIX LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.; and Alaska Dept. of Fish and Game, Anchorage.
For primary bibliographic entry see Field 7C.
W77-09069

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
For primary bibliographic entry see Field 7C.
W77-09075

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
C. R. Demas.
Open-file report 76-853, December 1976. 304 p, 15 plates, 15 tab, 6 ref.

Descriptors: *Environmental effects, *Dredging, *Navigable waters, *Louisiana, Sampling, Water analysis, Bottom sediments, Chemical analysis, Metals, Pesticides, Nutrients, Organic compounds, Evaluation, Path of pollutants.
Identifiers: *Elutriate.

The U.S. Geological Survey, in cooperation with the U.S. Army Corps of Engineers, conducted a series of elutriate studies in selected reaches of major navigable waterways of Louisiana. As defined by the U.S. Environmental Protection Agency, an elutriate is the supernatant resulting from the vigorous 30-minute shaking of one part bottom sediment from the dredging site with four parts water (vol/vol) collected from the dredging site followed by one hour settling time and appropriate centrifugation and a 0.45-micron filtration. The elutriate studies were initiated to evaluate possible environmental effects of proposed dredging activities in selected reaches of Louisiana waterways. The waterways investigated were the Mississippi River-Gulf Outlet, Breton Sound, Mississippi River downstream from Baton Rouge, Bayou Long, Intracoastal Waterway (east and west of the Harvey Canal), Three Rivers area, Ouachita River, Barataria Bay, Houma Navigation Canal, Atchafalaya Bay (Ship Channel), Berwick Bay, Intracoastal Waterway (Port Allen to Morgan City), Petite Anse area, and Calcasieu River and Ship Channel. The Geological Survey collected 227 samples of native water and bed (bottom) material from 130 different sites. These samples (as well as elutriates prepared from mixtures of native water and bed material) were analyzed for selected metal, pesticide, nutrient, and organic constituents. An additional 116 bed samples collected at 58 sites were analyzed for selected pesticides; and 4 additional native-water samples from 2 sites were analyzed for selected metal pesticide, nutrient, and organic constituents. (Woodard-USGS)
W77-09084

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN AND NEAR GRAND TETON NATIONAL PARK, WYOMING, THROUGH OCTOBER 1976,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-09087

WILLIMANTIC RIVER ORGANISMS GROWN IN MEDIA WITH NATURAL SUBSTRATE LEVELS AS INOCULA FOR ALGAL ASSAYS,
Connecticut Univ., Storrs, Inst. of Water Resources.
For primary bibliographic entry see Field 5C.
W77-09091

EFFECTS OF PRIMARY SEWAGE EFFLUENT FROM THE CITY OF WILLIMANTIC ON THE BENTHIC INVERTEBRATE FAUNA OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09093

REAL-TIME MEASUREMENTS OF AQUATIC NITROGEN,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5D.
W77-09095

THE EFFECT OF SECONDARILY TREATED SEWAGE ON THE ALGAL POPULATIONS OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5C.
W77-09096

5B. Sources Of Pollution

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5G.
W77-08602

NITROGEN REMOVAL FROM SECONDARY EFFLUENT BY A LABORATORY SOIL COLUMN,
Hawaii Univ., Honolulu. Water Resources Research Center.
G. L. Dugan, P. C. Ekern, and R. T. Tsutsui.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 773, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No 102, August 1976. 25 p, 7 fig, 2 tab, 30 ref, 3 append. OWRT A-048-HI(1). 14-31-0001-5011.

Descriptors: *Nitrogen, Denitrification, *Percolation, Effluents, *Hawaii, Waste disposal, Soils, Path of pollutants, Water pollution sources.
Identifiers: *Land disposal, Latosol, *Oxisol.

The objective was the investigation of the percolate rate and the disposition of nitrogen from a laboratory soil column when chlorinated secondary sewage effluent was applied under both continuous and intermittent loading. A 1.7-m (5.5-in.) diameter column was packed to a depth of 1.5 m (5 ft) with a well-aggregated Oxisol soil (Lahaina series). A constant head was maintained by a modified Mariotte bottle during the application of effluent. Percolate was sampled through ports at 7 depths as well as from a bottom drain. When effluent was continuously ponded on the surface: (1) percolate rate decreased with time, (2) ammonium ions were adsorbed, (3) nitrification was suppressed, (4) denitrification occurred, and (5) the denitrification biological community required more than 2 days to develop. When effluent application was stopped after 2 days and aerobic conditions developed, nitrification was very active within 5 days. The solute breakthrough curve appeared well in advance of 1 pore volume and was highly skewed with an extended tail.
W77-08607

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
H. D. Copp.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 799, Price codes: A03 in paper copy, A01 in microfiche. Progress Report, July 1, 1975. 22 p, 10 fig, 8 tab. OWRT A-067-WASH(1). 14-31-0001-5048.

Descriptors: *Evaporation, Nutrients, *Water balance, Eutrophication, Hydrology, *Lakes, *Washington, Recreation, *Water pollution sources, Lake basins, Watersheds(Basins).
Identifiers: *Non-point source pollution, *Newman Lake Basin(Wash), *Liberty Lake Basin(Wash), *Williams Lake Basin(Wash).

Data were collected over a complete water year (October 1 to September 30). The objective was to assess the water resources of three rather small, freshwater lake basins in eastern Washington State. Each lake provides a source of water-oriented recreation, particularly during the summer season. Land occupation consists of forest cover, range lands, ranching, and resident living. Most of the latter occurs as summer homes on and near the lake shores. Most of the occupation generates water-borne waste which could find its way into the lakes either directly or via surface and subsurface streamflow. Assessment of the water resources may lead to the identification of water pollution sources. (McHenzie-Wash State)
W77-08608

BITUMINOID FORMATION IN THE MUD SEDIMENTS OF DOMESTIC SEWAGE, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.

For primary bibliographic entry see Field 5A.
W77-08618

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
L. M. Games, and J. M. Hayes.
Journal Water Pollution Control Federation, Vol. 49, No. 4, p 668-677, April, 1977. 7 fig, 6 tab, 22 ref.

Descriptors: *Water pollution sources, *Carbon, *Landfills, Municipal wastes, Waste disposal, Groundwater movement, Organic compounds, Leachate, Inorganic compounds, Water analysis, Path of pollutants, Indiana, *Isotope studies.
Identifiers: Isotope ratio measurements, Columbus(Ind).

Carbon is present in ground water in various forms and amounts, and sanitary landfills represent an important unnatural input of carbon to nearby aquifers. Little is known, however, about the movement of carbon in ground water or the extent of its interactions of a biological or physical nature over time. In this study, comparisons of carbon isotope ratios were used to analyze ground water entering the Columbus, Indiana landfill site, the landfill leachate, and ground water leaving the landfill area. Water taken from six wells was analyzed for concentrations of volatile organic carbon, nonvolatile organic carbon, and inorganic carbon. The findings emphasized the need to study more than one type of carbon compound when assessing the chemical effects of unnatural carbon inputs, and that a long period of observation is necessary to fully picture reactions taking place between natural and contaminant ground water carbon. It was concluded that the Columbus landfill did not significantly affect the bulk carbon content of the underlying aquifer, although contamination by trace amounts of highly toxic materials is still a theoretical possibility. The isotopic investigation method in and of itself was judged very useful for this and similar studies. (Eberle-NWWA)
W77-08670

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, SYMPOSIUM.
International Association of Hydrological Sciences, Paris (France).
For primary bibliographic entry see Field 2K.
W77-08677

THERMAL AND CHEMICAL PROBLEMS OF THERMAL WATERS, (LES PROBLEMES THERMIQUES ET CHIMIQUES DES EAUX THERMALES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
H. J. Schoeller.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 1-5, 5 ref.

Descriptors: *Reviews, *Thermal pollution, Heated water, Chemistry, Temperature, Research and development, Thermal water, Water pollution, Water chemistry.

This paper presents an overview of the existing problems of thermal waters. Aspects considered include the source of temperature and chemical composition; geological factors; status of present knowledge and methods of research. (See also W77-08677) (Chilton-ORNL)
W77-08678

SOME FEATURES OF THE GEOCHEMISTRY OF THERMAL WATER IN PLATFORM AREAS FROM EXPERIMENTAL DATA,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. G. Kissin, and S. I. Pakhomov.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 7-15, 3 fig, 1 tab, 4 ref.

Descriptors: *Geochemistry, Hydrology, *Thermal pollution, Heated water, Sea water, Temperature, Chemical activity, Thermodynamics, *Thermal water, Water pollution.

Rocks classified as clayey, sandy, carbonate and cristalline were leached with distilled water, sea water, sodium and calcium NaCl solutions at temperatures ranging from 20-250C. At high temperatures, data showed a decrease in pH values and potassium content and an increase in silic-acid and boric-acid contents. Calcium sulfate and carbonate content and the composition of rocks affected temperature metamorphization of water with gypsum bearing rocks causing sharpest variations. At high temperatures, metamorphization of sea water in contact with carbonate rocks resulted in a sharp decrease in sulfate and Mg ion concentration. Free CO2, liberated by hydrolysis, caused an increase in chemical activity of thermal water. (See also W77-08677) (Chilton-ORNL)
W77-08679

THE HELIUM ISOTOPES IN THERMAL FLUIDS,
Akademiya Nauk SSR, Moscow. Geologicheskii Institut.
B. G. Polak, V. I. Kononov, I. N. Tolstikhin, B. Mamyrin, and L. V. Khabarin.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 17-33, 5 fig, 3 tab, 12 ref.

Descriptors: *Geochemistry, Hydrology, Heated water, *Helium, *Isotope studies, *Thermal water, Tracers.

The study compares the isotopic composition of helium from thermal fluids discharged in tectonically mobile belts of the earth where there are favorable conditions for the outflow of abyssal matter and energy from the interior onto the earth's surface. It was concluded that there is no direct connection between He3/He4 values and the general gas composition of thermal fluids. It appeared that helium with the mantle isotopic composition and the main components of hydrothermae gas are formed at different levels, helium being supplied from the deepest interiors. (See also W77-08677) (Chilton-ORNL)
W77-08680

HYDROTHERMAL PROCESSES IN THE ATLANTIC OCEAN CRUST, 26 DEGREES N,
Texas A and M Univ., College Station. Dept. of Geology.
For primary bibliographic entry see Field 2K.
W77-08681

THE CONTENT OF SILICA IN HOT MINERAL WATERS OF FRANCE IN RELATION TO TEMPERATURE, SODIUM CONTENT AND BICARBONATES (LA TENEUR EN SILICE DES EAUX THERMOMINERALES DE FRANCE EN RELATION AVEC LA TEMPERATURE, LA TENEUR EN SODIUM ET EN BICARBONATES),
Bordeaux Univ., Talence (France). Centre d'Hydrogeologie.
For primary bibliographic entry see Field 2K.
W77-08686

SOME GEOCHEMICAL PROBLEMS IN THE UTILIZATION OF GEOTHERMAL WATERS,
Department of Scientific and Industrial Research, Wellington (New Zealand). Chemistry Div.
A. J. Ellis.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium August/September, 1975. p 100-109, 5 tab, 2 fig, 15 ref.

Descriptors: *Geothermal studies, Environmental effects, Salinity, *Heated water, Temperature, Silica, Chemistry, Water utilization, Thermal water, Reviews.

Recent research on the disposal of geothermal waters is reviewed. The environmental effects of geothermal discharges as they relate to vegetation damage or contamination of local waterways is emphasizes. The particular problems encountered by the chemistry of silica in solution, its polymerization and precipitation processes are discussed, including the development of a pilot-scale process to remove silica from geothermal waters. (See also W77-08677) (Chilton-ORNL)
W77-08687

STUDY OF THE CHEMICAL AND GASEOUS COMPOSITION OF THERMAL WATERS OF THE EASTERN PART OF THE PANNONIAN DEPRESSION (CONSIDERATIONS SUR LA COMPOSITION CHIMIQUE ET GAZEUSE DES EAUX THERMALES DE LA PARTIE ORIENTALE DE LA DEPRESSION PANNONIQUE (ROUMANIE)),
Institutul de Geologie si Geofizica, Bucharest (Rumania).
For primary bibliographic entry see Field 2K.
W77-08688

RESULTS OF A MICROBIOLOGICAL INVESTIGATION OF THE DANUBE RIVER BY ONE POINT PROFILE (1969-1971), (IN GERMAN),
I. Daubner, and B. Trzilova.
Biologia (Bratisl). 28(9), p 775-781, 1973.

Descriptors: *Rivers, *Aquatic bacteria, *E coli, *Aquatic microorganisms, *Water pollution sources, Microorganisms, Plankton, River flow, Sugar crops, Organic wastes.
Identifiers: *Austria, *Czechoslovakia, *Danube River, Heterotrophic bacteria, Fecal pollution.

In comparison with previous years, no substantial changes were noticed either in the number or in the dynamics of microbical plankton taken as a whole or in the individual components. The number of bacteria is inversely proportional to the flow/s, which points to the mountainous character of the river (diluted pollution). The increase in the number of heterotrophic bacteria is considerably influenced by the sugar-production season in Austria and Moravia (Czechoslovakia) (Sept.-Dec.), but the microbial plankton, taken as a whole, is not affected. During the whole period of investigation (1961-1971) there was a gradual decrease of Escherichia coli (principal fecal pollution indicator species) from 46.5% to 29.7%; atypical strains gradually increased in the same period from 4.6% to 38.2%. This phenomenon probably reflects the increased pollution, particularly with specific toxic substances.--Copyright 1974, Biological Abstracts, Inc.
W77-08694

ESTIMATION AND EVALUATION OF RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM: I. AN APPLICATION OF THE COMPARTMENT MODEL TO TRANSFER OF RADIOACTIVE SUBSTANCES THROUGH A FOOD CHAIN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5C.
W77-08695

THE EFFECT OF SOIL MOISTURE ON THE DEVELOPMENT OF SOIL MICROFLORA IN CONDITIONS OF FIELD EXPERIMENTS, (IN SLOVAK),
Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).
L. Haban.
Ved Pr Vysk Ustavu Rastlinne J Vyroby Pi-estanoch. 11, p 27-34, 1973.

Descriptors: *Soil moisture, *Soil microorganisms, *Soil bacteria, Topsoil, Loam, Clay loam, Cultures.
Identifiers: Ammonifying bacteria, Amylolytic bacteria, Cellulose-decomposing, Bacteria, Pectinolytic bacteria, Amino acid-decomposing bacteria, Correlations, Czernosem.

Correlations between the soil moisture and the development of 6 cultured groups of microorganisms were investigated in field trial using different methods of increasing of topsoil on a degraded czernosem and loamy to clayey soils. A high significant correlation dependence was found between the number of bacteria and the soil moisture. A higher correlation dependence between the development of the cultured groups and the soil moisture was found, except for the cellulose decomposing bacteria, in the subsoil layer. The response of the individual cultured groups of bacteria varied with soil moisture conditions. Most susceptible were the cellulose decomposing microorganisms, pectinolytic bacteria and amino acid decomposing bacteria. Less susceptible were protein decomposing (ammonifying) bacteria and amylolytic bacteria. The correlation between humin matter decomposing bacteria and the soil moisture was insignificant.--Copyright 1974, Biological Abstracts, Inc.
W77-08696

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
For primary bibliographic entry see Field 5C.
W77-08697

THE BEHAVIOUR OF DISSOLVED IRON, MANGANESE AND ZINC IN THE BEAULIEU ESTUARY, S. ENGLAND,
University of East Anglia, Norwich (England). School of Environmental Sciences.
L. M. Holliday, and P. S. Liss.
Estuarine and Coastal Marine Science, Vol. 4, 1976, p 349-353, 3 fig, 10 ref.

Descriptors: Chemistry, Sea water, *Salinity, *Iron, *Manganese, *Zinc, Hydrogen ion concentration, Estuaries, *Dissolved solids, Water pollution sources.
Identifiers: Beaulieu Estuary(England).

The relationship between salinity and the concentration of dissolved iron, manganese, and zinc are reported. Rapid removal of iron as salinity increased was apparent. This removal is almost complete by the time the salinity of the estuarine water has reached 15%. A possible hypothesis to explain the removal mechanism is homogeneous precipitation of hydrous iron oxides formed as a result of change in pH associated with the mixing process. In contrast to the large scale removal observed for iron, any deviation from conservative behaviour for manganese and zinc were either small or non-existent. (Chilton-ORNL)
W77-08701

THE DISTRIBUTION OF TRACE METALS IN THE WESTERN NORTH ATLANTIC OFF NOVA SCOTIA,
Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Atlantic Oceanographic Lab.
J. M. Bewers, B. Sundry, and P. A. Yeats.
Geochimica et Cosmochimica Acta, Vol. 40, No. 6, 1976, p 687-696, 9 fig, 5 tab, 26 ref.

Descriptors: *Water pollution sources, Pollutants, *Trace elements, Manganese, Iron, *North Atlantic, Sediments, Runoff, *Path of pollutants, *Distribution, *Canada, Metals.
Identifiers: Trace metals.

Significant differences between water mass trace element concentrations were found with the most striking feature of the distributions being that, with the exception of manganese, the Atlantic Slope water contained lower trace metal concentrations than the underlying Central Atlantic water. Concentrations of Fe and Mn extracted from suspended matter on the Scotian Shelf were higher than those in the non-detrital fraction of the underlying sediments. Mn showed major nearshore increases in concentration related to continental runoff but Fe concentrations are controlled by particulate matter distribution. For other trace elements, the effects of both continental runoff and anthropogenic activity appeared to be minor even a few miles from the coast. (Chilton-ORNL)
W77-08703

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
For primary bibliographic entry see Field 5C.
W77-08704

TRANSPORT OF MOLYBDENUM IN MOUNTAINOUS STREAMS, COLORADO,
Colorado Univ., Boulder. Dept. of Geological Sciences.
D. S. Kaback.
Geochimica et Cosmochimica Acta, Vol. 40, 1976, p 581-582, 2 tab, 1 ref.

Descriptors: *Water pollution effects, *Water pollution sources, Mine wastes, Metals, *Molybdenum, Streams, *Colorado, *Path of pollutants.

The study investigated the transport of Mo in river sediments and waters of Colorado with the principal area of interest being in the drainage below a large mining and milling operation. In most cases the molybdenum carried in water was largely in true solution but at certain times of the year the suspended load in samples taken near the mill showed 300-325 ppm (19% of the total load in the water at that time). (Chilton-ORNL)
W77-08705

AN ECOLOGICAL MODEL FOR HEAVY METAL CONTAMINATION OF CROPS AND GROUND WATER,
Royal Danish School of Pharmacy, Copenhagen.
S. E. Jorgensen.
Ecological Modelling, Vol. 2, 1976, p 59-67, 2 fig, 5 tab, 6 ref.

Descriptors: *Model studies, Ecology, Sludge, *Soil contamination, Pollutants, *Lead, *Groundwater, Crops, *Heavy metals, *Path of pollutants, Water pollution sources.

The model reported is able to predict the concentration of heavy metals in ground water and crops when sludge is added to the soil. Model prediction indicates that Pb is limiting the use of sludge as a soil conditioner and that crop contamination appears to be a greater danger than ground water contamination. It is indicated that municipal sludge can be used in considerable quantities without danger if soil has a high humus or clay content and the pH is maintained close to 7.00. It was concluded that, while the model has given acceptably good results, the number of case studies are limited and that the model should therefore be used cautiously. (Chilton-ORNL)
W77-08706

CLEARCUTTING IN PENNSYLVANIA,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 4C.
W77-08712

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08747

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
M. C. Goldberg.
The Science of the Total Environment, Vol 5, p 277-294, 1976: Elsevier Scientific Publishing Company, Amsterdam, Netherlands, 1976. 11 fig, 2 tab, 17 ref.

Descriptors: *Organic pesticides, *Aqueous solutions, *Bottom sediments, *Chlorinated hydrocarbon pesticides, *Herbicides, Sampling, Chemical analysis, Analytical techniques, Water pollution, Agricultural chemicals.
Identifiers: *Total organic concentrations.

The origin of small organic molecules in surface waters of the United States, for the most part, stems from industrial, urban and agricultural sources. Agricultural materials were examined, particularly the chlorinated pesticides and herbicides, to determine concentration ranges within which the characteristic interactions of these solutes could be defined. Chlorinated hydrocarbon concentrations of bottom sediments at selected locations ranged from 5 ng/kg (nanograms per kilograms) to 3.5 micrograms per kilograms, and in water from 5 ng/liter to 0.06 micrograms per liter. Herbicide concentrations in water ranged from 5 ng/liter to 1.5 micrograms per liter for the same samples. Total organic carbon concentrations at these locations ranged from less than 0.1 to 42 milligrams per liter. (Woodard-USGS)
W77-08754

FATE AND BIOLOGICAL EFFECTS OF MERCURY INTRODUCED INTO ARTIFICIAL STREAMS,
Savannash River Ecology Lab., Aiken, S.C.
For primary bibliographic entry see Field 5C.
W77-08757

THE MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS,
Texas Univ. at Austin. Dept. of Microbiology.
D. T. Gibson.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 128, Price codes: A04 in paper copy, A01 in microfiche. Office of Naval Research, Washington, D.C., June, 1976. 51 p, 2 fig, 26 ref.

Descriptors: Bacteria, Biochemistry, *Biodegradation, *Oil, *Oil spills, Oily water, Laboratory tests, *Phenols, Enzymes, Hydrogen ion concentration, Organic compounds, *Aromatic compounds, Physiology, *Oil wastes, *Oil pollution, *Microbial degradation.
Identifiers: *Ortho-xylene, *Nocardia, Enzymatic fission, Hydrolytic reaction, *Chlorobiphenyl, *Monochlorinated biphenyl isomers.

The biodegradation of ortho-xylene by a species of Nocardia is initiated by nuclear oxidation to form 3,4-dimethylcatechol. The latter compound is apparently formed from cis-3,4-dimethyl-3,5-cyclohexadien-1,2-diol (cis-o-xylene dihydrodiol). Enzymatic fission of 3,4-dimethylcatechol produces an acid, 2-hydroxy-5-methyl-6-oxohepta-2,4-dienoic acid, that undergoes spectral changes at acid and alkaline pH. Further metabolism of the ring-fission product occurs by a hydrolytic reaction that forms acetic and 2-oxohex-4-enoic acids. Enzymatic hydration of the latter compound to give 4-hydroxy-2-oxohexanoate is followed by an aldolase reaction that produces pyruvate and propionaldehyde. The pathway proposed for the biodegradation of o-xylene is analogous to those reported for the degradation of a number of aromatic compounds. Commercial samples of 2-, 3-, and 4-chlorobiphenyl contain impurities that cause lag periods in the growth of Beijerinckia on succinate. Purified preparations of these compounds also inhibited the initiation of growth of this organism but not to the same extent. Preliminary observations suggest that inhibition may be associated with the ease of oxidation of the monochlorinated biphenyl isomers. (Katz)
W77-08759

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08762

FATE OF LABELED N-ALKANES IN THE BLUE CRAB AND STRIPPED MULLET,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08764

THE EFFECT OF THE IMPOUNDMENT OF LAKE KAINJI, NIGERIA, ON THE INDIGENOUS SPECIES OF MORMYRID FISHES,
Reading Univ. (England). Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W77-08772

TOXICITY, ACCUMULATION, AND RELEASE OF THREE POLYCHLORINATED NAPHTHALENES (HALOWAX 1000, 1013, AND 1099) IN POSTLARVAL AND ADULT GRASS SHRIMP, PALAEMONETES PUGIO,
Texas A and M Univ., College Station. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-08773

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W77-08775

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
For primary bibliographic entry see Field 5C.
W77-08781

POLYCHLORINATED BIPHENYLS IN ADULT MAYFLIES (HEXAGENIA BILINEATA) FROM THE UPPER MISSISSIPPI RIVER,
Fish and Wildlife Service La. Crosse, Wis. Fish Pesticide Research Unit.
For primary bibliographic entry see Field 5C.
W77-08783

CONCENTRATIONS OF PCBS, DIELDRIN AND DDT RESIDUES IN MARINE ANIMALS FROM LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08788

INCORPORATION OF BENZATHRONE INTO THE NUCLEI OF GYRODINIUM SP. AND THE HEREDITY OF CONSEQUENT MITOTIC DELAYS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5C.
W77-08796

SIMULATION OF POLLUTANT MOVEMENT IN GROUNDWATER AQUIFERS,
Texas A and M Univ., College Station. Dept. of Agricultural Engineering.
R. Khaleel, and D. L. Reddell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 835, Price codes: A12 in paper copy, A01 in microfiche. Texas Water Resources Institute, College Station, Technical Report No 81, September 1976. 248 p, 47 fig, 87 ref, 6 append. OWRT A-030-TEX(1). 14-31-0001-5044, 14-31-0001-6045.

Descriptors: Groundwater, *Groundwater movement, *Dispersion, *FLow, *Aquifers, *Path of pollutants, *Simulation analysis, *Model studies, Infiltration, Porous media, Equations.
Identifiers: Computer simulators, Numerical simulators.

A three-dimensional model describing the two-phase (air-water) fluid flow equations in an integrated saturated-unsaturated porous medium was developed. Also, a three-dimensional convective-dispersion equation describing the movement of a conservative, noninteracting tracer in a nonhomogeneous, anisotropic porous medium was developed. Finite difference forms of these two equations were solved using an implicit scheme to solve for water or air pressures, an explicit scheme to solve for water and air saturations, and the method of characteristics with a numerical tensor transofmration to solve the convective-dispersion equations. The inclusion of air as a second fluid phase caused the infiltration rate to decrease rapidly to a value well below the saturated hydraulic conductivity when the air became compressed. This is in contrast to one-phase fluid flow problems in which the saturated hydraulic conductivity is considered to be the lower bound for the infiltration rate. A typical two-dimensional drainage problem in agriculture was solved in a nonhomogeneous, integrated saturated-unsaturated medium using the total simulator of fluid flow and convective-dispersion equations. A variety of outputs, such as an equipotential map or a solute concentration map, were obtained at selected time steps. A field-size problem describing the migration of septic-tank wastes around the perimeter of a lake was also considered and solved using the total simulator. The unique features of this model are (1) infiltration was treated as a two-phase fluid (air-water) flow process, (2) the complete subsurface regime (saturated and unsaturated) was considered as a unified whole, (3) the nonhomogeneous nature of a porous media and a variety of realistic boundary conditions are considered and (4) the tensorial nature of the dispersion coefficients was recognized.
W77-08807

EVALUATION OF NITRIFICATION IN THE WATER COLUMN OF THE PASSAIC RIVER,
Rutgers - The State Univ., New Brunswick N. J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W77-08813

PRODUCTION AND HEAVY METAL CONCENTRATION OF VASCULAR AQUATIC MACROPHYTES IN THREE EASTERN CONNECTITUCT RIVERS,
Connecticut Univ., Storrs.

R. M. Heisey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 834, Price codes: A06 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 97 p, 11 fig, 20 tab, 124 ref. append. OWRT A-502-CONN(9), 4-31-0001-3507.

Descriptors: *Water pollution sources, Water pollution treatment, *Bioindicators, *Heavy metals, *Aquatic plants, *Productivity, Rivers, *Lead, *Copper, Industrial wastes, Municipal wastes, *Connecticut, *Absorption.
Identifiers: *Gasoline combustion fallout, *Human influence, Pontederia, Potamogeton, Connecticut rivers.

The purpose was to determine the extent of heavy metal uptake by aquatic angiosperms and to ascertain whether concentrations in plant tissues are useful indicators of the amounts of these metals present in the environment. Significant differences were found in the concentration of lead and copper in plants (Pontederia and Potamogeton) growing in three Connecticut rivers which are subject to differing degrees of human influence. In general, concentrations of copper and lead were higher in below-ground Pontederia section than in the shoots. Lead concentrations of Pontederia tops were roughly comparable to these of whole Potamogeton plants. Copper concentrations of submersed and floating-leaved plants were much higher than those in Pontederia tops. Copper concentrations reflected the presence of a printed circuit factory in one area; variation in lead concentrations indicated differences in the amount of aerial fallout from the combustion of leaded gasoline, the major source of lead in the study area. Metal concentrations of Potamogeton appear to more nearly reflect the occurrence of copper and lead in river water, as the bottom substrate probably mediates the effects of river water on Pontederia. (deLara - Conn)
W77-08814

MINERAL DISTRIBUTION WITHIN THE SEDIMENTS OF PEARL HARBOR,
Hawaii Univ., Honolulu. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 2L.
W77-08815

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
M. F. Walter, G. D. Bubenzer, and J. C. Converse.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 832, Price codes: A02 in paper copy, A01 in microfiche. Reprint, Paper No 74-2018, Presented at 1974 Annual Meeting of American Society of Agricultural Engineers, Stillwater, Oklahoma, June 26-26, 1974. 21 p, 10 fig, 4 tab, 14 ref. OWRT B-076-WIS(4). 14-31-0001-3946.

Descriptors: Unsaturated flow, Liquid waste, Waste disposal, *Farm wastes, *Agricultural runoff, *Soil contamination, *Ammonia, *Nitrogen, Water poilution, Water quality, Model studies, *Wisconsin, *Nitrates, Distribution, Dairy industry, Soil water movement, Temperature, *Path of pollutants, Dispersion.

A model to predict vertical nitrate distribution in soil resulting from heavy land applications of anaerobic liquid dairy waste was developed. The model predicts net nitrogen transformations to nitrate as a function of temperature. Nitrate movement is based on predicted one-dimensional unsaturated flow and solute dispersion.
W77-08819

THE DESIGN OF A SYSTEM FOR COLLECTING LEACHATE FROM A LINED LANDFILL SITE,
Toronto Univ. (Ontario). Dept. of Geophysics.
For primary bibliographic entry see Field 5G.
W77-08827

SIMULATION OF TWO-DIMENSIONAL CONTAMINANT TRANSPORT WITH ISOPARAMETRIC HERMITIAN FINITE ELEMENTS,
Princeton Univ., N.J. Dept. of Civil Engineering.
M. T. van Genuchten, G. F. Pinder, and E. O. Frind.
Water Resources Research, Vol. 13, No. 2, p 451-458, April 1977. 10 fig, 11 ref. EPA R803827-01.

Descriptors: *Pollutants, *Soil contamination, *Model studies, *Mathematical models, Mathematical studies, Mathematics, Finite element analysis, *Path of pollutants, Dispersion, Infiltration, Analytical techniques, Data processing, Groundwater movement.

A deformed isoparametric Hermitian element can be used in the simulation of two-dimensional contaminant transport. The degree of freedom arising from the cross derivative may be eliminated in the Galerkin-type finite element formulation, reducing the computational effort per node. Two example problems demonstrated that the Hermitian element gives results which are comparable to those obtained with the zero-order continuous cubic element but requires 25-40% fewer degrees of freedom, depending on the geometrical description of the problem. (Sims-ISWS)
W77-08829

EFFECT OF THE BOUNDARY SURFACE BETWEEN SEA AND FRESH WATERS ON THE DISTRIBUTION OF DISSOLVED OXYGEN IN THE MOUTH REGION OF THE DNIEPER RIVER,
Ye. P. Kirillova.
Soviet Hydrology, Selected Papers, No. 4, p 227-228, 1975. 1 fig, 3 ref. Translated from Trudy Gosudarstvennogo Okeanograficheskogo Instituta, No. 118, p 31-34, 1974.

Descriptors: *Estuaries, *Dissolved oxygen, *Rivers, Lagoons, On-site investigations, Saline water-freshwater interfaces, Sea water, Freshwater, Spatial distribution, Runoff, Foreign countries, Foreign research, Sediments, Turbidity, Oxygen, Water quality, Water chemistry.
Identifiers: *Dnieper River, *USSR.

Dissolved oxygen is one of the most important hydrochemical elements for the existence of aquatic organisms and for the decomposition of organic substances in a body of water. Oxygen distribution in the mouth area of the Dnieper is determined mainly by hydrologic-hydrochemical conditions that depend on the Dniepter runoff. The spatial distribution of oxygen in the mouth area of the Dnieper River was determined by the position of the boundary surface and water transparency, which are directly related to the freshwater runoff of the river. The largest zones with a high oxygen deficit form most frequently in summer, when the slopes of the boundary between fresh and salt waters are small. (Sims-ISWS)
W77-08832

DENSITY CURRENTS AND THEIR APPLICATIONS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
T. W. Kao.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings paper 12947, p 543-555, May 1977. 4 fig, 8 ref, 2 append. NSF ENG75-09347.

Descriptors: *Density currents, *Water spreading, *Model studies, Mathematical models, Sludge disposal, Oil spills, Discharge(Water), Heated water, Sewage, Sewage sludge, Sewage disposal, Lakes, Reservoirs, Stratification, Density stratification, Water pollution.

The velocity of propagation of a variety of gravity motivated density currents was given. Several stratification configurations of the ambient fluid environment were considered. Applications were given to surface warm discharge in lakes or reservoirs, the spreading of a slug of sewage sludge at the thermocline level of the sea or lake, and the spreading of oil slick on water surface. Extension of the result to axisymmetric spreading also was given. (Sims-ISWS)
W77-08844

OCEANOGRAPHIC FEATURES, CURRENTS, AND TRANSPORT IN CABOT STRAIT,
Quebec Univ., Rimouski. Dept. of Oceanography.
For primary bibliographic entry see Field 2L.
W77-08851

SOURCES OF TAR POLLUTION ON ISRAELI MEDITERRANEAN COAST,
Israel Petroleum Inst., Tel-Aviv.
Y. Shekel, and R. Ravid.
Environmental Science and Technology, Vol 11, No 5, p 502-505, May 1977. 6 fig, 1 tab, 16 ref.

Descriptors: *Oil pollution, *Oil industry, Pollutants, *Oil wastes, *Oily water, Analytical techniques, Organic compounds, Solvent extractions, Oil, Fuels, International waters, Water pollution, Oil spills, Chemical analysis, Organic wastes, Gas chromatography.
Identifiers: Tar pollution, *Israeli Mediterranean Coast, *Curde oil, *Tar ball pollutants, *Israel, *Mediterranean Sea, Sulfur content, Vanadium/nickel ratio.

A survey was made to find the sources of tar balls polluting the Mediterranean coast of Israel. Samples were collected fortnightly from eight stations along the shore from September 1973 to January 1975. According to chromatographic analysis, 76% of the tar balls were formed from weathered crude oil (GC-1) + crude oil sludge (GC-2), 18% from weathered fuel oil (GC-3), 4% were greatly weathered, and 2% of the samples were unidentified. According to the vanadium/nickel ratio and sulfur contents, 96% of the tar balls formed from GC-1 + GC-2 were from Middle Eastern sources. The degree weathering of the samples showed that 46% of the tar balls formed from GC-1 + GC-2 were exposed at sea for about a fortnight, 41% for more than two months, and 13% probably for one to two years. (Henley-ISWS)
W77-08852

COMPREHENSIVE OCEANOGRAPHIC BASELINE STUDY AT BARCELONETA, PUERTO RICO.
Black and Veatch, Kansas City, Mo.
M. J. Graham, G. R. Miller, and P. E. Schafer.
Journal of the Water Pollution Control Federation, Vol 49, No 4, p 558-567, April 1977. 5 fig, 3 tab, 6 ref.

Descriptors: *Baseline studies, *Waste water disposal, *Benthos, *Diurnal distribution, *Oceanography, Diurnal, Aquatic productivity, Ecological distribution, Ocean currents, Outfall sewers, Sewerage, Sediments, Sediment distribution, Water pollution sources, Tidal waters, Waste water(Pollution), Water quality, *Puerto Rico.
Identifiers: *Oceanographic baseline study, Predischarge investigation, *Barceloneta(Puerto Rico), *Manati River(Puerto Rico).

An interdisciplinary baseline study was conducted at an open ocean site on the north coast of Puerto

Rico. A sampling network of 27 water chemistry stations and 15 benthos/plankton stations was used to characterize the ocean water and sediment and to define the influence of the nearby Manati River. It was found that the Manati River, which presently receives the discharge of essentially raw domestic and industrial wastewater, was probably the source of most of the coliforms, turbidity, nitrates, nitrites, phosphorus, and silica in the study area waters. The river also may be the origin of arsenic, beryllium, chromium, and zinc. (Henley-ISWS)
W77-08853

HYDROTHERMAL FLUIDS OF SEAWATER SALINITY IN OPHIOLITIC SULPHIDE ORE DEPOSITS IN CYPRUS,
Oxford Univ. (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W77-08854

SYSTEMATIC IDENTIFICATION OF DO-BOD MODEL STRUCTURE,
Cambridge Univ. (England). Control Div.
B. Beck, and P. Young.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE5, Proceedings paper No. 12461, p 909-927, October 1976. 9 fig, 38 ref.

Descriptors: *Water quality, *Statistical methods, *Rivers, *Dynamics, *Dissolved oxygen, *Biochemical oxygen demand, Algal control, Estimating, Algorithms, Equations, Model studies.
Identifiers: Extended Kalman Filter, Human factors, Model tests, Recursive routines, Identification, Solar energy, Time factors.

The Extended Kalman Filter (EKF) provides a logical statistically-based extension to those existing approaches to model fitting based on deterministic model response error (surface) minimization. Its crucial feature as a basis for identification, however, is the recursive nature of the algorithm which permits the estimation of possible variations in the model parameters. Depending upon whether or not such estimated variations are realistic, bearing in mind the physical nature of the dynamic system, it is possible to formulate criteria for model adequacy. This approach to model identification was applied to the problem of modeling DO-BOD interaction in a freshwater river system based on daily field data. It was found that the basic model structure, as defined by a dynamic version of the Streeter-Phelps equations, was inadequate and, in the case of the river considered, it was necessary to introduce additional 'sustained sunlight' terms to account for the effects of floating algal populations. (Bell-Cornell)
W77-08866

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
E. G. Foree.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE5, Proceedings paper No. 12448, p 937-952, October 1976. 6 fig, 3 tab, 9 ref.

Descriptors: *Water quality, *Computer models, *Reaeration, *Velocity, *Oxygenation, *Dissolved oxygen, Tracers, Streams, Low flow, Systems analysis, Equations, Dams, Height, *Kentucky, Waterfalls, Forecasting.
Identifiers: Dissolved oxygen analyzers.

The radioactive tracer technique employing dye, krypton-85 and tritium was utilized for the determination of reaeration and velocity characteristics of small streams. Based on work conducted over a 3-year period, models are developed to predict reaeration coefficient and velocity associated with a particular stream reach as a function of its slope and specific discharge (stream discharge per unit drainage basin area). Reaeration at dams is predicted as a function of the height of fall over the dam. These concepts have been incorporated into a general computer model for prediction of stream dissolved oxygen profiles and an example application is presented. (Bell-Cornell)
W77-08867

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. McLaughlin, J. A. Elder, G. T. Orlob, D. F. Kibler, and D. E. Evenson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 543, Price codes: A16 in paper copy, A01 in microfiche. NOAA Technical Memorandum ERL MESA-4, December 1975. 68 fig, 33 tab. Contract 3-35423.

Descriptors: New York, *Ecosystems, *Baseline studies, *Environmental effects, Estuaries, Water pollution, Fisheries.
Identifiers: *Outer Continental Shelf, *New York Bight, Resources management.

A comprehensive, conceptual representation of the physical, geological, chemical and biological processes that affect the New York Bight ecosystem is presented as well as some specific recommendations suggesting where field and laboratory research efforts should be undertaken to support a satisfactory evaluation of management alternatives. The important problems in the New York Bight are identified in order to develop effective strategies and research efforts towards solving them. They are: the movement of undesirable materials onto beaches, shellfish contamination, and a decline and instability in migratory fisheries. As each problem is described, the critical subsystems are identified, reviewed in the light of present knowledge, and a set of recommendations or research tasks for future implementation is proposed. (Sinha-OEIS)
W77-08900

IDENTIFICATION OF WEATHERED OIL FILMS FOUND IN THE MARINE ENVIRONMENT,
Exxon Research and Engineering Co., Linden, N. J. Governmental Research Lab.
For primary bibliographic entry see Field 5A.
W77-08901

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-242 175, Price codes: A15 in paper copy, A01 in microfiche. Environmental Protection Agency, Environmental Protection Technology Series No. EPA-670/2-75-062, June 1975. 333 p, 38 fig, 51 tab, 101 ref. R-801799.

Descriptors: *Water pollution effects, *Environmental effects, Water pollution sources, Boating, Lakes, Aquatic life, Lead, Organic compounds, Oil pollution.
Identifiers: Outboard marine engines.

The objective of the study was to obtain sufficient laboratory and field data to be able to predict the number of outboard engines which can be operated on any particular body of water without causing adverse effects on the aquatic environment. Four small natural bodies of water were subjected to outboard engine emissions three times greater than saturation (maximum) levels occurring under normal boating conditions. These natural water bodies were stressed at these high levels with outboard engine exhaust emission for a period of three years. The study showed that there were no acute changes in the physical, chemical or biological characteristics of the water or sediments of the test lakes. No major adverse effects were found on water quality or the biological communities (periphyton, phytoplankton, zooplankton, benthos and fish) indigenous to the test lakes. No adverse accumulation of lead or hydrocarbons in the water column was observed. Also, no satistically significant accumulation of lead or hydrocarbons was noticed to be taking place in the lake sediments. (Sinha-OEIS)
W77-08902

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
A. H. Eraslan.
Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-4940, Price codes: A08 in paper copy, A01 in microfiche. Report to Nuclear Regulatory Commission, Washington, D.C., February 1975. 164 p, 79 fig, 1 tab, 62 ref. W-7405-eng-26.

Descriptors: *Thermal pollution, *Powerplants, *Environmental effects, *Resources development, Nuclear powerplants, *Mathematical models, Cooling water, Tides, Coasts, Ocean circulation, Model studies.
Identifiers: *Outer continental shelf.

A far-field mathematical model is presented for numerical simulation of short-time (within tidal cycle) transient, two-dimensional temperature distributions in large coastal and offshore regions resulting from the condenser cooling water discharges of power plants. The general mathematical formulation considers completely arbitrary, transient oceanic flow conditions, which include periodic tidal, geostrophic and wind-induced currents, as locally specified inputs to the model. The fundamental differences, both from physical and mathematical considerations, between mesoscale and micro-scale eddy turbulence, shear flow dispersion, and stratification are discussed in detail to establish a realistic formulation of depth-averaged, nonconvective thermal energy fluxes associated with the general turbulent transport phenomenon. The general mathematical model is applied to the assessment of the thermal impact of a hypothetical multiunit generating station in a coastal region where the oceanic flow conditions are assumed to be strictly periodic tidal currents without any appreciable net drift of sufficient duration to remove the heated effluent out of the far-field region. It is concluded that steady-state near-field studies of the individual discharges are definitely inadequate, and a transient far-field analysis which considers the variations in oceanic flow conditions is essential for the realistic assessment of the thermal impact of a large nuclear power plant in a coastal or offshore region. (Sinha-OEIS)
W77-08905

N2 : AR, NITRIFICATION AND DENITRIFICATION IN SOUTHERN CALIFORNIA BORDERLAND BASIN SEDIMENTS,
Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 5A.
W77-08907

A BIODEGRADATION OF OIL ON WATER SURFACES,
Office of Naval Research, Arlington, Va.
For primary bibliographic entry see Field 5G.
W77-08909

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-08916

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
C. A. Benson, R. W. Hann, Jr., and T. W. Reynolds.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-252 544, Price codes: A07 in paper copy, A01 in microfiche. Sea Grant Report No. TAMU-SG-75-213, January 1976. 142 p, 22 fig, 15 tab, 4 append.

Descriptors: *Estuaries, *Aeration, *Mathematical models, *Water pollution control, *Texas, Dispersion, Waste disposal, Computer programs.

A one-dimensional dynamic mathematical model was developed for computer solution of estuarine dispersion problems. The math model was based on the one-dimensional mass transfer equation for the longtudinal distribution of a substance in a variable area stuary. Finite-difference approximations of the mass transfer equation were used to develop the numerical model. Model results showed that wastes are adequately degraded in the channel and do not accumulate to excessive levels. These results were compared with field data obtained from sampling runs in the Harbor Channel. This work showed that dispersion and dilution would greatly affect the oxygen transfer effeciency of a surface aeration system. Dissolved oxygen levels in the Houston Ship Channel, however, were determined to be the controlling factor affecting efficiency of aeration. Model results showed that inchannel aeration would not only improve oxygen levels in the channel, but greatly reduced the organic load discharged into Galveston Bay. Another conclusion was that tidal flows would have little influence on the efficiency of a surface aeration system operating on the Houston Ship Channel.
W77-08917

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 694, Price codes: A04 in paper copy, A01 in microfiche. Third Annual Report of the Environmental Protection Agency on Administration of Title I of the Marine Protection, Research, and Sanctuaries Act of 1972, as amended, June 1975. 66 p, 2 fig, 8 tab.

Descriptors: *Waste disposal, *Water pollution control, *Baseline studies, *Environmental effects.
Identifiers: *Outer Continental Shelf, *Ocean dumping, Dredged material disposal, Outfalls, *Resource management.

The Act became effective April 23, 1973, and since that time all ocean dumping of waste materials transported for the purpose of dumping has been done under permit from EPA except for dredged material, which is regulated by the Corps of Engineers. This annual report covers the second full year of regulation of ocean dumping by EPA under Title I of the Act, and it offers the first opportunity to make quantitative comparison of how ocean dumping has changed since the Act became effective. Eleven ocean dumping sites in the Atlantic Ocean and the Gulf of Mexico are now in active use for municipal and industrial wastes. There is no dumping of these wastes in the Pacific, although municipal sewage sludge is discharged to the ocean through outfalls. These discharges are regulated under the permit system. Ocean dumping site surveys are due to begin this year. A detailed baseline survey is currently being conducted in the New York Bight for an alternate site for sewage sludge disposal. EPA is also studying and evaluating two dump sites, one industrial and one municipal, off Delaware Bay, and is cooperating with NOAA in studies of a deepwater site off the continental shelf east of Cape Henlopen, Delaware. (Sinha - OEIS)
W77-08919

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
K. V. R. Henkel, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 025, Price codes: A15 in paper copy, A01 in microfiche. Ph.D. Thesis, 1973. 314 p, 58 fig, 7 tab, 73 ref, 6 append. OWRT B-080-WIS(5). 14-31-0001-3948.

Descriptors: *Water quality, *Stratification, *Heat exchangers, *Model studies, *Vertical migration, Mixing, Heated water, Impoundments, Thermal pollution, Cooling water.

This theoretical and experimental study investigated vertical mixing, induxed in a thermally stratified impoundment, by the introduction of a warm water discharge near the impoundment bottom. Laboratory tests, conducted in an 18 inch diameter, circular tank and a 4 foot square tank, varied the following variables systematically: (1) inlet velocity; (2) temperature difference between discharge and tank bottom water; (3) location of discharge; (4) surface layer thickness; and (5) initial temperature difference between tank surface and bottom layers. From the tests, correlations were found relating the time to mix each tank to various dimensional and non-dimensional combinations of the above variables. Coupling the conservation laws for volume and heat in the impoundment, including surface heat exchange, with those for volume, heat and momentum of a warm water discharge, a model was developed for the transient vertical thermal structure of an impoundment. The model, when applied to the laboratory tanks, agreed very well with the measured profiles. The model (without a warm water discharge), when applied to Lakes Mendota and Monona, showed reasonable agreement with observed temperature profiles. Comparisons were made between the simulated temperature profiles with and without a warm water discharge for Lake Monona. Consequences, potential problems and applications of condenser cooling water discharges for inducing vertical mixing in thermally stratified impoundments are discussed. (See also W74-12370) (Hooper-Wisc)
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5C.
W77-08930

SEASONAL PATTERNS OF DISSOLVED OXYGEN, NUTRIENTS, AND METALS IN NATURAL AND CHANNELIZED SWAMP STREAMS,
North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
E. J. Kuenzler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 979, Price codes: A02 in paper copy, A01 in microfiche. Paper presented at Workshop on Freshwater Forested Wetland Research, Dept. of Env. Engr. Scs., Univ. of Florida, Gainesville, Jan 15-16, 1976. 21 p, 8 fig, 2 tab, 25 ref. OWRT B-084-NC(1). 14-31-0001-5100.

Descriptors: *Channel improvement, Water quality, *Nutrients, *Metals, *Dissolved oxygen, Wetlands, Flood plains, Channelized, *Seasonal, *Swamps, *North Carolina, Distribution patterns, Water pollution sources, *Path of pollutants.
Identifiers: *Channelized streams, Flood plain swamps, Eastern North Carolina, Swamp streams.

In 1974 the Water Resources Research Institute of The University of North Carolina funded this research project to investigate certain aspects of water quality in natural flood-plain swamps, and the perturbations in these water quality parameters resulting from stream channelization. Six streams were selected in the Atlantic Coastal Plain province of North Carolina just above the tidewater region. This area has a subtropical, moist climate with warm summers and cool winters. The mean annual rainfall is about 120 cm. Conclusions at thise point are - small Coastal Plain streams, natural or channelized, are dynamic. They exhibit marked seasonal changes in flow and in water quality. The waters of natural streams are soft, moderately acid, stained with brown color, and very low in nutrients, especially NO+3 and soluble reactive phosphorous. Oxxygen may nearly disappear in summer. The low-D.O. period coincided with the period of maximum NH+4, Kjeldahl-N, particulate-P, Fe, Mn, Ca, and Mg. The factors determining these seasonal patterns are not yet established but the redox potential and the relative importance of base flow vs. runoff seem likely. (Stewart-NC State)
W77-08932

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
T. J. Stolinski, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 976, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, May 1975. 186 p, 15 fig, 15 tab, 51 ref, 5 append. OWRT A-036-NEB(1). 14-31-0001-5027.

Descriptors: *Agricultural runoff, *Water quality, Runoff, *Computer models, Forecasting, *Drainage, Simulation analysis, Watersheds(Basins), *Agricultural watersheds, Water pollution sources.
Identifiers: Agricultural pollution.

This project was designed to obtain additional needed information relative to agricultural pollution and to aid in the verification and development of computer models for simulation of this runoff. An agriculturally oriented watershed was instrumented to obtain information relative to rainfall and resulting runoff. In addition, data were obtained relative to cropping practices including chemical application, crop yields, etc. Data obtained are to be used in verifying and modifying available modeling techniques. Due to unusually dry weather during the summer of 1974, storm runoff was essentially non-existent after completion of instrumentation on July 1. As a result, data were not available for use. Therefore, information relative to the reliability of existing computer models is not included, but instead, a discussion is presented of various available modeling techniques and the basis for their use. The discussion also includes the sources and nature of various agricultural pollutants.
W77-08934

CHARACTERIZATION OF URBAN RUNOFF IN GREENFIELD, MASSACHUSETTS--PHASE I,
Massachusetts Univ., Amherst. Dept. of Civil Engineering.
F. A. DiGiano, M. P. Donahue, and P. L. Heirtzler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 984, Price codes: A06 in paper copy, A01 in microfiche. Publication No. 50, July 1975. 102 p, 17 tab, 20 fig, 27 ref, 2 append. OWRT C-5341(No.4239)(1).

Descriptors: *Waste identification, *Water pollution sources, *Urban runoff, *Massachusetts, Sampling, *Monitoring, Measurement, Water quality, Phosphorus, Chlorides, Biochemical oxygen demand, Carbon, Sewers, Coliforms.
Identifiers: *Non-point pollution sources, Greenfield(Mass), *Green River(Mass), *Total organic carbon.

The primary interest of this research focuses on the importance of both the short term impacts on water quality requirements and the longer term disruptions to normal stream ecology that may be caused by urban runoff. This report includes water quality data obtained from April 1974 to June 1975. Sample points in the Green River were selected such that the contribution of urban runoff from various sources and land use patterns could be measured. Water quality data consist mainly of weekly measurement of specific parameters at 6 sampling stations in the river's urban reach and measured impacts of several storm events. Parameters of most interest are B.O.D., T.O.C., total P, Cl, turbidity, total and fecal coliforms, oil and grease. Increases in concentrations of most pollutat parameters were noted during wet weather. Mean loading rates were 269, 26, 15, and 717 lb/sq mile/day for B.O.D., T.O.C, total P, and chloride, respectively. However, combined sewer overflows increased loadings on several days and prevented accurate assessment of the urban runoff contribution.
W77-08939

FREQUENCY OF ORGANIC COMPOUNDS IDENTIFIED IN WATER,
Environmental Research Lab., Athens, Ga.
For primary bibliographic entry see Field 5A.
W77-08944

QUALITATIVE AND QUANTITATIVE CHANGES IN THE BENTHIC FAUNA OF A TROUT STREAM, THE COUZE PAVIN PUY-DE-DOME, CAUSED BY AGRICULTURAL AND URBAN POLLUTION, (IN FRENCH),
Institut National de la Recherche Agronomique, Paris (France).
For primary bibliographic entry see Field 5C.
W77-08955

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
A. M. Elprince, C. I. Rich, and D. C. Martens.
Water Resources Research, Vol 13, No 2, p 375-380, April 1977. 3 fig, 1 tab, 38 ref. ERDA E(40-1)-4851.

Descriptors: *Cesium, *South Carolina, *Radioactive wastes, *Nuclear reactors, *Thermal pollutions, *Radioisotopes, Nuclear wastes, Water pollution sources, Radiochemical analysis, Water quality, Water pollution, Adsorption, Chemical properties, Expansive clays, Heat pollution, Water temperature, Physical properties, Sediments.
Identifiers: *Water-cooled nuclear reactors, *Heated water pollution, *Savannah River Plant(SC), Bottom sediment adsorption, Hydroxy aluminum interlayers.

The adsorption of Cs137 by sediments from the Savannah River Plant follows a theoretically expected linear relationship between 1n Kd and 1/T where Kd and T are the equilibrium distribution coefficient (Cs adsorbed, meg/g/Cs(+) in solution, meq/m1) and the temperature in kelvins, respectively. The slope of the plots decreases after removal of hydroxy Al interlayers with citrate pretreatment. Hydroxy Al interlayers thus make Cs(+) adsorption more temperature dependent. The thermal effect of hydroxy Al interlayers becomes more significant in sediments containing a nonswelling 2:1-2:2 intergrade clay mineral than in those sediments containing a swelling 2:1-2:2 intergrade clay mineral. The phenomenon was explained by considering hydroxy Al interlayers as a source of hydronium ions H30(-) which compete with Cs(+) for exchange positions in wedge zones. An increase in temperature favors an increase in H30(-) ions, which in turn favors less adsorption of Cs(+). Aside from the thermal effect, the positively charged hydroxy aluminum polymeric groups drastically decrease the cation exchange capacity and, consequently, the adsorption of cesium. (Henley-ISWS)
W77-09024

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
For primary bibliographic entry see Field 5G.
W77-09028

NATURAL STREAM TEMPERATURE VARIATIONS IN A CATCHMENT,
Environment Protection Authority, Victoria (Australia).
J. H. Walker, and J. D. Lawson.
Water Research, Vol 11, No 4, p 373-377, 1977. 1 fig, 7 tab, 10 ref.

Descriptors: *Watersheds(Basins), *Water temperature, *Model studies, *Australia, Streams, Rivers, Temperature, Thermal water, Air temperature, On-site data collections, Cooling, Water cooling, Heat transfer, Water pollution, *Thermal pollution.

In order to establish water temperature criteria or limits for reaches of streams downstream from thermal discharges, a knowledge of the natural water temperature is necessary. To overcome the situation where no historical records are available, a simple method of predicting natural water temperatures in a catchment was presented. The only data required for computation are the site altitude and the air temperature at a station in the catchment, or the natural water temperature in an upstream reach or other tributary in the catchment. The time scale of the predicted water temperature is a function of the frequency of measurement of the independent variables. (Sims-ISWS)
W77-09039

DISPERSION MEASUREMENT ON THE DANUBE,
Research Inst. for Water Resources Development, Budapest (Hungary).
L. Somlyody.
Water Research, Vol 11, No 4, p 411-417, 1977. 7 fig, 2 tab, 16 ref.

Descriptors: *Dispersion, *Rivers, *Dye releases, *Model studies, Mathematical models, Dye concentration, Dye dispersion, Fluorescent dye, Tracers, Mixing, On-site investigations, Water quality, Foreign countries, Water pollution, Foreign research, Path of pollutants, Streamflow.
Identifiers: *Danube River, *Hungary, Dispersion coefficients.

In formulating the two-dimensional mixing model for a 52 km long section of the River Danube, the dispersion conditions were studied. Three tracer experiments were performed at two different streamflow rates (1900 and 1050 cu m/s) and at constant feed. For determining the transverse dispersion coefficient, a new method based on the equations of the mass flux constant line was developed. Examination of the observation data showed the dispersion coefficient pertaining to the greater streamflow to be more than twice as high as the one at the smaller streamflow (0.033 and 0.013 sq m/s). The variation with streamflow is approximated well by a formula. (Sims-ISWS)
W77-09040

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
For primary bibliographic entry see Field 5G.
W77-09041

SOLUTE TRAVEL TIMES TO WELLS,
Iowa State Univ., Ames. Dept. of Agronomy; and Iowa State Univ., Ames. Dept. of Physics.
D. Kirkham, and S. B. Affleck.
Ground Water, Vol 15, No 3, p 231-242, May - June 1977. 7 fig, 15 ref. NSF ENG75-19394.

Descriptors: *Groundwater, *Solutes, *Groundwater movement, *Travel time, *Model studies, Mathematical models, Aqueous solutions, Nitrates, Wells, Water wells, Water pollution, *Water pollution sources, Hydraulic conductivity, Aquifers, Rivers, Permeability.
Identifiers: Solute concentration.

Theoretical travel times were given for a solute to reach a well from an injection point for wells that fully penetrate confined aquifers of constant thickness and mainly constant conductivity and porosity. Solute is assumed to move along streamlines with the water in piston flow under steady flow conditions. Three cases were considered. (1) For a 'standard' well of external radius of influence r sub e and well radius r sub w, the travel time varies approximately directly as the square of the distance r of the injection point from the well, as the ratio f/K of porosity to conductivity, and as 1n r sub e/r sub w. (2) For a well in which the flow region is divided by radius r sub c into two regions, with the region next to the well clogged and of very low conductivity, K sub I, the travel time varies approximately directly as r squared, as f/K sub I, and as 1n r sub c/r sub w. (3) For a well being fed from a line drive (river) at a distance d from the well, the travel time from a point on the line drive to the well varies as the distance d squared, as f/K, as 1n 2d/r sub w, and as a function of the position of the point along the line drive. In each case, the travel time is inversely proportional to h sub e - h sub w, where h sub e is the head at the radius of influence r sub e (or at the line drive) and h sub w is the head at the well. In the three cases, doubling the pumping rate halves the travel time. Travel times can affect the extent of chemical changes of the solute (contaminant) during its flow to the well. (Sims-ISWS)
W77-09042

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
W. L. Bradford.
Journal Water Pollution Control Federation, Vol 49, No 4, p 613-622, April 1977. 5 tab, 18 ref. EPA 68-01-1846.

Descriptors: *Storm runoff, *Urban runoff, *Pollutants, *Mathematical studies, *Load distribution, Mathematics, Statistical methods, Statistics, Runoff, Surface runoff, Sampling, Data collections, Storm water, Watersheds(Divides), Drainage systems, Water pollution sources, Water quality, Water pollution, Suspended solids, Trace elements.

Identifiers: *Pollutant loadings, *Storm water composition, Coliform organisms, Total solids, Loading rates.

The data on urban storm water pollutant loading rates and composition available from the literature published through 1972 were used to find differences related to differing regions of the nation, gross land use types, average daily traffic, type of landscaping, and type of street surface. From 153 records, the mean and standard deviation of dust and dirt loading rates and composition were calculated for each of the independent variables listed and compared to those of the entire data set. Although apparent differences exist between subsets and the whole set of data, with some important exceptions, the null hypothesis was accepted at the 95% confidence level in most cases. To improve future analyses, study methods need to be more standardized than at present. (Henley-ISWS)
W77-09046

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
P. K. Misra, and E. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 079, Price codes: A05 in paper copy, A01 in microfiche. Kansas State Bulletin, KWRRI Contribution No 105. Kansas Engineering Experiment Station, Special Report Number 109, July 19, 1972. 89 p, 19 fig, 20 tab, 29 ref. OWRT A-048-KAN(3). 14-31-0001-3516.

Descriptors: *Water quality, *Model studies, *Estimating, *Algorithms, Statistical methods, Dynamic programming, Streams.
Identifiers: *Ninlinear estimation, *Stream modeling.

The various approximate nonlinear estimation algorithms are summarized and applied to the estimation of parameters in stream quality based on the Camp and Dibbins model. The advantages and drawbacks of the various estimation algorithms are compared by using the numerical results. The nonlinear algorithms studied are linearized Kalman filter, invariant imbedding least squares filter, the first order and second order minimal variance filters, the Gaussian minimal variance filter, maximum a posteriori filter, and dynamic programming least squares filter. (See also W75-04614 and W75-01111)
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
P. K. Misra, and E. S. Lee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 099, Price codes: A04 in paper copy, A01 in microfiche. Kansas State Univ., Bulletin, KWRRI Contribution No. 104. Kansas Engineering Experiment Station, Special Report Number 110, July 19, 1972. 58 p, 14 fig, 2 tab, 13 ref. OWRT A-048-KAN(4), 14-31-0001-3516.

Descriptors: *Water quality, *Estimating, *Model studies, Optimization, Statistical methods.
Identifiers: Linear estimation, Stream modeling.

The various linear estimation schemes are discussed and summarized. The Kalman filter and the invariant imbedding filter are applied to the estimation of the parameters in stream quality modeling. The results are discussed in terms of convergence rate and the influence of noisy data. Statistical mismatch is also discussed. (See also W75-04614 and W75-01111)
W77-09052

ADSORPTION AND VERTICAL MOVEMENT OF THE ZINC AND MANGANESE IONS IN THREE TYPES OF SOIL,
Tuskegee Inst., Ala. Dept. of Plant and Soil Science.
R. J. Patel.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 191, Price codes: A05 in paper copy, A01 in microfiche. M. S. Thesis, August 1974, 76 p, 13 fig, 15 tab, 87 ref, append. OWRT B-028-ALA(5), 14-31-0001-3053.

Descriptors: *Adsorption, *Zinc, *Ions, Retention, *Manganese, *Soil types, Vertical migration, *Soil chemistry, Leaching, Chelation, Ion exchange, Path of pollutants, Water pollution, Metals.

The adsorption pattern of zinc and manganese ion was studied in three different types of soil: Hoytville, Nebraska and Troup. The soil samples were first leached with 1N ammonium acetate solution and were then equilibrated with the metal solutions of different concentrations ranging from 0.1 to 0.8 me, per gram of soil. The retention of these metals by the soils was evaluated in three different forms: exchangeable, chelated, and non-displaceable. To displace zinc and manganese held in the exchangeable and chelated forms, 1N KCl and 0.1 N Cu-(0Ac)2 solutions respectively were used. Adsorption data of the metals more used to compute the relative amount of soil material complexed with one mole of the cation and the stability constant of the resulting soil-metal complex. The data indicated that relatively more of zinc and manganese was adsorbed by the Hoytville soil than by the Nebraska or Troup soil. In general, the stability constant for the total adsorption of either zinc or manganese in any soil was comparatively greater than that for the other two fractions (chelated and non-displaceable) that were held in the soil. The concentration of zinc or manganese retained by the soils was more in the surface of the column and decreased progressively with depth.
W77-09054

SPECIES DIFFERENCES IN BREAKDOWN OF TREE LEAVES IN STREAMS--SIGNIFICANCE FOR COMPOSITION OF STREAM COMMUNITIES,
California Univ., Santa Barbara, Marine Science Inst.
A. M. Wenner, A. L. Busath, and R. P. Howmiller.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 194, Price codes: A03 in paper copy, A01 in microfiche. California Water Resources Center, Davis, Report No. 39, May, 1977. 29 p, 7 fig, 4 tab, 17 ref. (California Water Resources Center Project UCAL-WRC-W-492). OWRT-A-055-CAL(3).

Descriptors: *Riparian plants, *Invertebrates, Streams, *Leaves, *Decomposing organic matter, *Productivity, Detritus, Aquatic plants.

This report focuses on the possible influence of riparian vegetation on the composition and productivity of stream invertebrate fauna by concentrating on the role of decomposing matter in streams. Experiments were performed to determine decomposition rates of various leaf types, as well as on comparative survival and growth of selected stream invertebrates raised on single leaf types in artificial streams. A field survey was made of leaf types and invertebrates in local streams to discover any relationship between detrital and faunal composition. This study was unable to confirm any direct correlation between leaf litter composition and faunal composition. Data from some riffle samples and qualitative observations at the time of collection revealed no obvious absences in any stream. Riffle samples tended to have more insect predators than did litter samples were detected. (Snyder-California, Davis)
W77-09056

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
For primary bibliographic entry see Field 5C.
W77-09059

A COMPARATIVE STUDY OF ORGANIC CARBON AND NUTRIENTS IN LAKE SEDIMENT,
Washington State Univ., Pullman. Dept. of Environmental Science.
For primary bibliographic entry see Field 5A.
W77-09065

THERMAL LOADING OF NATURAL STREAMS,
Geological Survey, Menlo Park, Calif. Water Resources Div.; and Geological Survey, Reston, Va. Water Resources Div.
A. P. Jackman, and N. Yotsukura.
Available from Supt. of Documents, GPO, Washington, DC, 20402, Price 70c. Professional Paper 991, 1977. 39 p, 42 fig, 2 tab, 45 ref.

Descriptors: *Model studies, *Thermal pollution, *Natural streams, *Heat transfer, *Diffusion, Water temperature, Mathematical models, Analytical techniques, Evaluation, Path of pollutants.
Identifiers: *Surface heat dissipation, Thermal transport models.

The impact of thermal loading on the temperature regime of natural streams is investigated by mathematical models, which describe both transport (convection-diffusion) and decay (surface dissipation) of waste heat over 1-hour or shorter time intervals. The models are derived from the principle of conservation of thermal energy for application to one- and two-dimensional spaces. The basic concept in these models is to separate water temperature into two parts, (1) excess temperature due to thermal loading and (2) natural (ambient) temperature. This separation allows excess temperature to be calculated from the models without incoming radiation data. Natural temperature may either be measured in prototypes or calculated from the model. If use is made of the model, however, incoming radiation is required as input data. Comparison of observed and calculated temperatures in seven natural streams shows that the models are capable of predicting transient temperature regimes satisfactorily in most cases. (Woodard-USGS)
W77-09068

A RECONNAISSANCE OF THE HYDROLOGY OF THE EDISTO AND ASHEPOO ESTUARIES, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W77-09076

A RECONNAISSANCE OF THE HYDROLOGY OF THE INTRACOASTAL WATERWAY FROM BUCKSPORT TO LITTLE RIVER INLET, SOUTH CAROLINA,
Geological Survey, Columbia, S.C. Water Resources Div.
For primary bibliographic entry see Field 2L.
W77-09077

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-09084

STORAGE OF LOW-LEVEL RADIOACTIVE WASTES IN THE GROUND: HYDROGEOLOGIC AND HYDROCHEMICAL FACTORS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 5E.
W77-09086

PRELIMINARY STUDY OF WASTEWATER MOVEMENT IN AND NEAR GRAND TETON NATIONAL PARK, WYOMING, THROUGH OCTOBER 1976,
Geological Survey, Cheyenne, Wyo. Water Resources Div.
E. R. Cox.
Open-file report 77-275, March 1977. 35 p, 5 fig, 7 tab, 2 ref.

Descriptors: *Path of pollutants, *Waste water(Pollution), *Effluents, *Sewage lagoons, *National parks, *Wyoming, Surface waters, Groundwater, Sampling, Wells, Streams, Water analysis, Chemical analysis, Evaluation.
Identifiers: *Grand Teton National Park(Wyo).

Investigations were made by the U.S. Geological Survey in cooperation with Teton County, Wyoming and the National Park Service to determine the effects on nearby lakes and streams of percolating wastewater effluent at three sites in and near Grand Teton National Park. Observation wells were drilled at two of the sites, and water samples were collected from the wells. Sites were established on selected streams to collect water samples and to measure streamflow. Sufficient data have not been collected at this time to determine in detail the baseline quality of water in the selected streams or the rate, direction, and velocity of movement of percolating effluents. However, theoretical concepts and data collected to date suggest that effluent percolating near Colter Bay Village is most likely moving westward and southwestward toward Swan Lake and Colter Bay. Effluent percolating near Moose is most likely moving southeastward and southward toward the Snake River. Effluents near Flagg Ranch and Huckleberry Hot Springs probably discharge into the Snake River and Polecat Creek, but the amounts are small. (Woodard-USGS)
W77-09087

POPULATION RESPONSE AND HEAVY METAL CONCENTRATIONS IN COTTONTAIL RABBITS AND SMALL MAMMALS IN WASTEWATER IRRIGATED HABITATS,
Pennsylvania State Univ., University Park. School of Forest Resources.
G. R. Bierei.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 186, Price codes: A03 in paper copy, A01 in microfiche. Master of Science Thesis in Wildlife Management, August 1974. 42 p, 11 tab, 1 fig, 29 ref, append. OWRT B-059-PA(4), 14-31-0001-3932.

Descriptors: *Heavy metals, *Small animals(Mammals), *Irrigation water, *Wildlife, *Effluents, Sewage effluents, Forests, Irrigation effects, Water pollution sources, Waste water disposal.
Identifiers: *Cottontail rabbits, *Wastewater irrigation, Weight gains.

Population characteristics and heavy metal concentrations of cottontail rabbits and small mammals were compared on control and effluent sprayed areas during 1971, 1972, and 1973. Population densities of rabbits in irrigated enclosures tended to be higher for 3 consecutive years though densities were not significantly different. Rabbit weights and adult weight gains were higher on irrigated areas. Wastewater irrigation of forested areas in early successionary stages appears to increase the carrying capacity for cottontail rabbits because of increased food and cover produced by the irrigation. Small mammal population densities were greater in the fall on irrigated areas and were probably related to increased production of herbaceous vegetation throughout the growing season. Spring densities on both irrigated and non-irrigated areas were not different, indicating no increase in carrying capacity over the winter months. Levels of most heavy metals in the tissues of cottontails and small mammals were not increased by wastewater irrigation. (Sink-Penn State)
W77-09097

5C. Effects Of Pollution

A PRIMER ON LIMNOLOGY,
Minnesota Univ., Minneapolis. Linmological Research Center.
For primary bibliographic entry see Field 2H.
W77-08605

SURVIVAL OF BACTERIA IN TURBID AND POLLUTED WATERS,
New Mexico State Univ., University Park. Dept. of Biology.
K. Y. Ahmed.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 801, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, August 1975. 39 p, 8 fig, 2 tab, 48 ref. OWRT A-052-NMEX(1).

Descriptors: *E coli, *Salmonella, Aquatic microorganisms, Bacteria, *Coliforms, Pathogenic bacteria, Sewage bacteria, *Rio Grande River, Temperature, Water temperature, Turbidity, Water pollution effects, *New Mexico.
Identifiers: *Glycogen, *Bacteria survival rate.

The survival of Escherichia coli B and Salmonella typhimurium was studied in polluted river water in situ and in controlled laboratory conditions. The die-off of both bacteria was very rapid in the river and the initial cell population was reduced by 90% in less than three days at the temperatures tested in the river (16 and 27.8 C.). In the laboratory conditions, E. Coli and S. typhimurium were reduced at 10 C. by 90% in 15 days and 13 days respectively. At 20 C. both bacteria were reduced by 90% within five days and at 25 C. a 90% reduction occurred in approximately two days. At 30 C. E. coli took ten days for a 90% reduction in viability while S. Typhimurium took less than 48 hours for the same viability loss. The role of glycogen in survival of both organisms seemed insignificant, as glycogen rich E. coli and S. typhimurium did not survive longer than cells with lower glycogen content with the exception of glycogen-rich E. coli at 25 C. (Hain-New Mex State)
W77-08606

HYDROLOGY OF THREE RECREATIONAL LAKES IN EASTERN WASHINGTON STATE,
Washington State Univ., Pullman. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08608

HEAVY METAL TOLERANCE OF MARINE PHYTOPLANKTON. III. COMBINED EFFECTS OF COPPER AND ZINC IONS ON CULTURES OF FOUR COMMON SPECIES,
Trondheim Univ. (Norway). Inst. of Marine Biochemistry.
G. S. Braek, and A. Jensen.
Journal of Experimental Marine Biology and Ecology, Vol 25, 1976, p 37-50, 8 fig, 6 tab, 12 ref.

Descriptors: Environmental effects, Metals, *Water pollution effects, Resistance, Copper, Zinc, Phytoplankton, Diatoms, Algae, *Heavy metals.
Identifiers: Synergism, Combined effects.

The combined effects of copper and zinc ions were studied using three marine diatoms and one dinoflagellate. Results showed that joint effects of copper and zinc on marine phytoplankton could not be predicted on the basis of the toxicity of the individual metals. A. carteri and T. pseudonana gave clear cases of synergism, while the metals acted as antagonists towards the diatom P. tricornutum. For the two clones of S. costatum tested it was found that the effect of combinations of the metals was greater than the sum of the effects caused by the components applied separately, although the sensitivity of S. costatum to copper did limit the range of the experiments. (See also W74-11329) (Chilton-ORNL)
W77-08692

MUSSELS (MYTILUS SP.) AS AN INDICATOR OF LEAD POLLUTION,
Scripps Institution of Oceanography, La Jolla, Calif.
T. J. Chow, H. G. Snyder, and C. B. Snyder.
The Science of the Total Environmental, Vol 6, 1976, p 55-63, 3 tab, 1 fig, 16 ref.

Descriptors: Environmental effects, *Water pollution, *Lead, *Mussels, Marine animals, Shellfish, Pacific Coast, *Bioindicators, Pollutant identification, Water pollution effects.

Two species of mussels (M. californianus and M. edulis) were collected along the Pacific Coast from Piedras Blancas to Punta Banda. The area depicts varying degrees of industrialization ranging from relatively undisturbed to heavily populated regions. On a dry weight basis, the whole soft parts of the mussels contained from 0.27 to 42 ppm of lead which could be related to their local habitats. Gill tissues contained the highest amount of lead. No difference was observed in the average isotope ratios of lead in the two species. (Chilton-ORNL)
W77-08693

RESULTS OF A MICROBIOLOGICAL INVESTIGATION OF THE DANUBE RIVER BY ONE POINT PROFILE (1969-1971), (IN GERMAN),
For primary bibliographic entry see Field 5B.
W77-08694

ESTIMATION AND EVALUATION OF RADIOACTIVE CONTAMINATION THROUGH A FOOD WEB IN AN AQUATIC ECOSYSTEM: I. AN APPLICATION OF THE COMPARTMENT MODEL TO TRANSFER OF RADIOACTIVE SUBSTANCES THROUGH A FOOD CHAIN,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
I. Aoyama, and Y. Inoue.
J Radiat Res. 14(4), p 375-381, 1973.

Descriptors: *Radioactivity effects, *Aquatic environment, *Model studies, *Food chains, *Fish, *Radioecology, Food webs, Sea water, Ecosystems, Absorption, Radioisotopes, Transfer, Pikes, Cichlids, Minnows, Cesium, Water pollution effects.
Identifiers: Cesium-137, Radioactive transfer, Compartment model.

A transfer of radioactive substance through a food chain in an aquatic ecosystem was analyzed through application of modified 3 compartment model of Aten's. The modification of the original model is an introduction of 2 processes, an excretion of radioactivity from Fish-1 (prey) to sea water and an direct uptake of radioactivity by Fish-2 (predator) from sea water. In the model, a following ration rate coefficient (k12) was defined as a mass transfer coefficient of a radioactive nuclide from prey to a predator; k sub 12 = theta M sub 1/M sub 2, where theta is an assimilation rate of a radioactive nuclide, M sub 1 is a daily average ration taken by a predator and M sub 2 is a weight of the predator. In the experimental

system, pike cichlids and minnows were used as predators and prey. 137Cs was used as a radionuclide in the system. The accumulation of a 137Cs in pike was explained by application of the above modified 3 compartment model and various parameters in the model were determined. This shows that the transfer of a radionuclide through a food chain can be estimated by knowing the uptake rate and the turnover rate of Fish-2 (predator). They in ecological term are a daily average ration and an assimilation rate respectively.--Copyright 1974, Biological Abstracts, Inc.
W77-08695

THE ROLE OF METHYLMERCURY PRODUCTION IN THE TRANSFER OF MERCURY IN A SALT MARSH ECOSYSTEM,
Skidaway Inst. of Oceanography, Savannah, Ga.
H. Windom, W. Gardner, J. Stephens, and F. Taylor.
Estuarine and Coastal Marine Science, Vol. 4, 1976, p 579-583, 2 tab, 13 ref. NSF (GX-33615).

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Path of pollutants, *Salt marshes, Sediments, Algae, Ecosystems, Estuarine environment, Estuaries, Georgia, Industrial wastes.
Identifiers: Primary consumers, *Methylmercury, Brunswick area(Geo).

A salt marsh estuary which had received large discharges of inorganic mercury for several years was studied. The concentration of mercury in sediments from the study area are higher than those from unpolluted salt marsh estuaries of the southeastern Atlantic coast. The methyl form was not detected in either the sediments or Spartina alterniflora. The primary consumers of the ecosystem represented the first trophic level which accumulated methylmercury with Littorina irrorata and Uca sp representing over 90% of the production at this level. The data indicated an annual methylmercury production in this ecosystem of approximately 50 microg/g total Hg contained in the upper 5 cm of the sediment. (Chilton-ORNL)
W77-08697

DOSE-DEPENDENT EFFECTS OF METHYLMERCURY ON LIMB REGENERATION OF NEWTS (TRITURUS VIRIDESCENS),
Wisconsin Univ.-Madison. Dept. of Anatomy; and Wisconsin Univ.-Madison. Dept. of Pathology.
L. W. Chang, L. L. M. Mak, and A. H. Martin.
Environmental Research, Vol. 11, 1976, p 305-309, 2 fig, 33 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Newts, Growth rates.
Identifiers: Regeneration, Cell growth, Tissue development, *Methylmercury, Dose-dependence.

Newts with amputated limbs were raised at a temperature of 25 C in solutions containing various concentrations of methyl mercuric chloride (0.01, 0.03, 0.05, 0.07, 0.1, 0.3, and 1.0 ppm). A general but significant delay in regeneration was observed in animals raised in mercury-water as compared to controls. The rate of regeneration in all the mercury-exposed animals seemed to be potentiated after the initiation of the regeneration. It was concluded that methylmercury has a dual inhibitory and stimulatory effect on cell growth and tissue development and that its effect is dose-dependent. (Chilton-ORNL)
W77-08699

METHYLMERCURY INDUCED INJURY OF SINGLE BARNACLE MUSCLE FIBERS,
Wisconsin Univ., Madison. Dept. of Physiology; and Wisconsin Univ., Madison. Dept. of Medicine.
H. Hift, and R. Schultz.
Environmental Research, Vol. 11, 1976, p 367-385, 22 fig, 20 ref.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, Toxicity, Sodium.
Identifiers: *Methylmercury, Muscle fibers, *Barnacles.

The effects of methylmercury on sodium transport, resting membrane potential, and ultrastructure of single barnacle muscle fibers were investigated. The results showed that methylmercury reduces sodium transport and that its primary site of action is the plasmalemma which deteriorates progressively. Experiments with ouabain indicated that the membrane sodium, potassium-ATPase system was affected by methylmercury. It was suggested that the observed reduction in Na efflux was the result of a reduced supply of ATP and that the terminal rise in Na efflux was the result of the destruction of the sarcolemma. Ultrastructure damage consisted of mitochondrial changes, the gradual disintegration of the sarcoplasmic reticulum, and the formation of gaps in the plasmalemma. (Chilton-ORNL)
W77-08700

EFFECTS OF MERCURY, CADMIUM, AND LEAD SALTS ON REGENERATION AND ECDYSIS IN THE FIDDLER CRAB, UCA PUGILATOR,
Rutgers - The State Univ., Newark, N.J. Dept. of Zoology and Physiology.
J. S. Weis.
Fishery Bulletin, Vol. 74, No. 2, 1976, p 464-467, 2 tab, 15 ref. N.I.H. Biomedical Grant No. RR 7059.

Descriptors: Environmental effects, *Water pollution effects, *Mercury, *Cadmium, *Lead, *Crabs, Salts.
Identifiers: Regeneration, Ecdysis, *Accabonac Harbor(NY).

Retardation of regeneration was a specific effect of cadmium on crabs exposed to concentrations of both 0.1 and 1.0 mg/l. At 0.1 mg/l, mercury caused almost total inhibition of limb growth but also proved lethal to 60% of the crabs indicating that the inhibition of regeneration may be not be a specific effect of mercury but an indication of the toxicity of the metal. A seasonal difference in sensitivity to both dose levels of cadmium and the higher concentration of mercury was seen, with the greater retarding effects being apparent during molting. (Chilton-ORNL)
W77-08702

TRACE ELEMENT INVENTORY FOR THE NORTHERN CHESAPEAKE BAY WITH EMPHASIS ON THE INFLUENCE OF MAN,
Maryland Univ., College Park. Dept. of Chemistry.
G. R. Helz.
Geochimica et Cosmochimica Acta, Vol. 40, No. 6, 1976, p 573- 580, 4 tab, 2 fig, 51 ref.

Descriptors: *Water pollution effects, *Water pollution sources, Pollutants, *Trace elements, *Chesapeake Bay, Sediments, Aqueous solutions, Industrial wastes, Municipal wastes, Fallout, *Maryland.
Identifiers: *Baltimore Harbor(Md).

An estimate of input from various sources of nine trace elements to the northern Chesapeake Bay revealed that human sources supply at least half of the Cr, Cu, Cd, and Pb. Human input is somewhat less for Mn, Fe, Co, Ni, and Zn. Atmospheric sources were the most important for Pb; municipal wastewater was the dominant source for Cd and heavy industry of Cu and Cr. Generally less than 1/3 of the present input could be accounted for in the sediments, with the exception of Cr and Fe. Sediments in areas of high human input (Baltimore Harbor) become enriched in an amount roughly proportional to the increased input so that the fraction retained in the sediments is similar to that in less heavily loaded area. (Chilton-ORNL)
W77-08704

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
M. O. Allum, R. E. Glessner, and J. H. Gakstatter.
Working Paper No 900, June 1977. 82 p, 68 ref, append.

Descriptors: *Eutrophication, *Evaluation, Algae, *Lakes, *Trophic level, Bioassay, *Nutrients, Data collections, *Phosphorus, *Nitrogen, *Primary productivity, Water pollution effects, *Surveys, Organic loading.

Because of the nation-wide scope of the National Eutrophication Survey and the time frame of less than four years for the completion of the sampling of 812 lakes and reservoirs, 4,000+ tributary sites, and over 800 municipal wastewater treatment plants, the Survey sampling program necessarily deviated from what ordinarily would be considered an ideal experimental design. As the Survey progressed, and to the degree permitted by the day-to-day work load, limited comparisons of Survey results with results published by others on the same water bodies were made. Specifically, it is concluded that: (1) the Survey water-body data compare very well with the reported data reviewed, considering the expected variability; (2) the trophic condition of most lakes and reservoirs can be adequately assessed on the basis of three periods of open-water sampling; (3) whether nitrogen, phosphorus, or some other element is limiting primary productivity in a water body can be inferred from algal assay results and nitrogen to phosphorus ratios; (4) considering temporal and spatial variability in nutrient concentrations, the Survey tributary nutrient data compare very well with the data reported by others; (5) for the purposes of the Survey, tributary nutrient loads were determined with acceptable accuracy with a sampling frequency of 14 times per year and flow data provided by the U.S. Geological Survey; (6) the Survey tributary total phosphorus loads and the in-water-body total phosphorus concentrations are highly correlated; (7) the effluent total phosphorus loads measured at 801 municipal wastewater treatment plants are in good agreement with expected values. (EPA-Corvallis)
W77-08710

EXPERIMENTAL DATA ON THE REGULATION OF 1,2-DIBROMOPROPANE IN RESERVOIR WATER, (IN RUSSIAN),
V. I. Antonova, N. E. Mishina, T. V. Vinokurova, G. P. Khazova, and L. L. Latkina.
Gig Sanit 3, p 105-106, 1976.

Descriptors: *Organic compounds, *Water supply, *Toxicity, Reservoirs, Regulation, Water quality standards, Lethal limit, Water pollution effects.
Identifiers: *Dibromopropane, USSR.

To determine the biologically active threshold concentration of 1,2-dibromopropane in the reservoirs of the sanitary and domestic water supply, various concentrations were tested for effect on sprophytic microflora, rats and mice. A threshold concentration of 0.1 mg/l was established, above which the microflora ceased to grow and the rats and mice manifested various functional, biochemical and pathological disorders.--Copyright 1977, Biological Abstracts, Inc.
W77-08718

NEOPLASTIC AND POSSIBLY RELATED SKIN LESIONS IN NEOTENIC TIGER SALAMANDERS FROM A SEWAGE LAGOON,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
F. L. Rose, and J. C. Harshbarger.
Science, Vol. 196, No. 4287, p 315-317, April, 1977. 1 fig, 8 ref.

Descriptors: *Cytological studies, *Salamanders, *Growth stages, *Lagoons, *Monitoring, Water

pollution effects, Chemical reactions, Biochemistry, Diseases, Water pollution, Waste water treatment, Settling basins.
Identifiers: Neoplasms, Carcinogens, Tiger salamanders, Skin lesions.

Neoplastic and other skin lesions were studied in neotenic tiger salamanders growing in a lagoon with high concentrations of secondary domestic sewage. Thirty to fifty percent of a 28,000 population developed skin lesions of which 84% were neoplasms. Salamanders in uncontaminated area lagoons developed normally with no neoplasms. Nonneoplastic lesions found were ascites, serous cysts, and epidermal inclusion cysts. Ascites were common to both test populations. The neoplastic lesions developed from skin epithelium, dermal fibroblasts, or dermal melanocytes. Water analyses were negative for 14 nitrosamines, but sediment analyses revealed 300 ppm of perylene, from jet fuel, and trace amounts of benzypyrene. Perylene has caused low tumorigenic activity in mice when combined with other polycyclic aromatic hydrocarbons. Tests should be conducted to determine its effects on salamanders. Metamorphic failure was determined to be a factor in tumorigenesis. Tiger salamanders were considered to be sensitive indicators for certain environmental carcinogens and could possibly monitor sewage ponds. Other vertebrate and invertebrate larval forms could be developed for such purposes by hormonally prolonging the length of the immature stages. (Collins-FIRL)
W77-08729

BIOLOGICALLY ACTIVE METABOLITES OF BLUE-GREEN ALGAE AND THEIR EFFECT ON EXPERIMENTAL ANIMALS, (IN RUSSIAN),
Kiev Research Inst. of General Communal Hygiene (USSR).
V. M. Orlovskii, and Yu. A. Kirpenko.
Gig Sanit 3, p 13-17, 1976.

Descriptors: *Algae, *Algal poisoning, *Anabaena, *Cyanophyta, Reservoirs, Metabolism, Water pollution effects.
Identifiers: Anabaena flos-aquae, Aphanizomenon flos-Aquae, Alga, Blooming, Carbohydrate oxidation, Blood catalase, Cholin esterase, Liver, Metabolites, Microcystis aeruginosa, Myo cardium, Thiaminease, USSR, Pyruvic acid.

Water from the Kremenchug reservoir (USSR) during blooming of blue-green algae, predominantly Microcystic aeruginosa, Aphanizomenon flos-aquae and Anabena flos-aquae, was administered daily to rats for 2.5 mo. Results indicated lowered cholinesterase and blood catalase activity, lower overall thiamine in the organs, the presence of thiaminase, higher concentrations of insufficiently oxidized products in the blood (particularly pyruvic acid) and degenerative changes in the liver and myocardium. Disturbances of carbohydrate oxidation is one of the basic elements of the mechanism of toxic action on warm-blood animals. The possiblity of exposure of humans and animals to biologically active metabolites of blue-green algae indicates that the blooming in water is a potential factor in the decrease of water quality and may lead to adverse consequences.
W77-08749

PARASITES AND DISEASES OF CULTURED CATFISH FOR THE PERIOD JULY 1, 1972 THROUGH JUNE 20, 1975,
Auburn Univ., Ala. Dept. of Fisheries and Allied Aquacultures.
W. A. Rogers, J. A. Plumb, J. H. Schachte, Jr., J. L. Gaines, and R. P. Phelps.
Available from the National Technical Information Service, Springfield, Va 22161 as PB-252 360, Price codes: A03 in paper copy, A01 in microfiche. Tennessee Fish and Game Commission, Project 2-194-R, Jan. 1976 26 p., 8 tab., 1 fig., 4 ref.

Descriptors: *Aquiculture, Freshwater fish, *Channel catfish, *Fish diseases, Pathology, Fish kill, *Bacteria, *Parasitism, *Viruses, *Pesticides, Water quality, Nutrients, *Fish hatcheries, Fish farming, Fish diets, *Fish parasites, Fish stimulants.
Identifiers: *Nutritional deficiencies, *Pathogens, Flavobacterium, Aeromonas, Flexibacter, Chondrococcus, Immunoglobins, Antibodies, Cultured catfish.

A total of 321 channel catfish cases are examined in this report. Fish kills were caused by viruses, bacteria, parasites, nutritional deficiencies, pesticides and water quality. Channel catfish eggs were destroyed by Flavobacterium sp. Field testing of Aeromonas hydrophila and Flexibacter (Chondrococcus) columnaris was carried out. Immunoglobulins in the serum, gut and skin mucous are characterized. Levels of antibody in the serum, gut and mucuous are determined. Homogenetic and heterogenetic strains of channel catfish were tested for their susceptibility to F. columnaris. (Katz)
W77-08756

FATE AND BIOLOGICAL EFFECTS OF MERCURY INTRODUCED INTO ARTIFICIAL STREAMS,
Savannash River Ecology Lab., Aiken, S.C.
H. J. Kania, R. L. Knight, and R. J. Beyers.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 833, Price codes: A07 in paper copy, A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-060, August 1976. 128 p, 5 tab, 52 fig, 91 ref, append.

Descriptors: *Mercury, *Metals, Streams, *Food chains, Aquatic animals, Water pollution, *Aquatic algae, *Aquatic microbiology, Sediments, Freshwater, Fishes, Invertebrates, Aquatic populations, Fish food organisms, *Periphyton, Laboratory tests, Methodology, Aquatic insects, Water pollution effects, Bioassay.
Identifiers: *Artificial streams, *Total mercury analyses, Periphytic communities, Tissue concentration, Periphytic algae, Life stage inhibition, Life stage stimulation, *Benthic insect communities.

Mercuric ion was continuously input to artificial stream channels to provide water concentrations of 0.01, 1.0 and 5.0 ug/l. Channel components were periodically sampled for total mercury analyses. The effects of mercury on the algal components of the periphytic communities and on the benthic insects were determined. The sampling program continued one full year after mercury inputs were stopped. Approximately 15% of the added mercury was removed from the water. The community components acquired very high concentrations of mercury, although in most cases the levels in these were not a linear function of the water levels. Concentrations in invertebrates decreased most rapidly after mercury inputs were stopped while the sediment levels decreased most slowly. Periphytic algae showed several treatment responses including total inhibition, inhibition of certain life stages, possible stimulation of certain life stages and morphological alterations. One species was found only in the treated channels and disappeared when mercury inputs were stopped. The diversity and evenness of benthic insect communities were affected by mercury treatment. (Katz)
W77-08757

EFFECTS OF A SPILL OF MARINE DIESEL OIL ON THE MEIOFAUNA OF A SANDY BEACH AT PICNIC BAY, HONG KONG,
Chinese Univ. of Hong Kong. Dept. of Biology.
A. P. Wormald.
Environmental Pollution, Vol 11, p 117-130, 1976. 3 fig, 4 tab, 19 ref.

Descriptors: Environmental effects, *Toxins, *Water pollution effects, Populations, *Oil spills, *Copepods, *Oil pollution, *Biological communities, Beaches, *Nematodes, Invertebrates, Oil, Food chains, Sediments, Water pollution, Sampling, On-site data collections, Tropical regions, Mortality.
Identifiers: *Picnic Bay(Hong Kong), *Marine diesel oil, *Meiofauna, *Harpticoids, Recolonisation.

The meiofauna of littoral sandy beaches in Picnic Bay, Hong Kong, was almost totally destroyed within four days of pollution by a heavy marine diesel oil in November, 1973, and recovery was monitored over the following 14 months. A few nematodes reappeared within one month of the spill but harpacticoids did not return in any numbers for 8 months, by which time the oil content had decreased by 50%. Apparently normal populations were established by September, 1974, the lower shore supporting much larger numbers than the steeper, coarser and drier upper shore. By January, 1975, Picnic Bay supported larger meiofauna communities than an unaffected shore, although numbers are lower than reported elsewhere at these latitudes. (Katz)
W77-08760

TOXICITY OF INTERMITTENT CHLORINATION TO BLUEGILL, LEPOMIS MACROCHIRUS: INTERACTION WITH TEMPERATURE,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology.
M. L. Bass, and A. G. Heath.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 416-423, April 1977. 2 fig, 3 tab, 11 ref.

Descriptors: *Toxicity, *Lethal limit, *Mortality, *Water temperature, *Chlorine, *Sunfishes, *Stress, Fish behavior, *Bioassay, *Heated water, Thermal pollution, *Chlorination, Water pollution sources, Water pollution effects, Environmental effects, Powerplants.
Identifiers: *Lepomis, *Sublethal effects, LT50, LC50.

Juvenile bluegills (Lepomis macrochirus) were held in test aquaria at 6, 15, 25 and 32C and were exposed to chlorine concentrations of 0.21, 0.31, 0.41, and 0.52 mg/l, three times a day for seven days. This was to simulate the intermittent release of chlorine into streams or lakes from power plants. Although no deaths occurred at 0.2 mg/l peak total chlorine, the behavior of fish at the two highest temperatures indicated that they were under stress. A distinct threshold of 0.3 mg/l peak total chlorine was observed, at which chlorine becomes toxic to bluegills. A notable temperature effect was found at peak total chlorine of 0.52 mg/l where the LT50 was 74 h at 6C and decreased to about 20 h at 32C. The 96 h LC50 was approximately 0.40-0.45 mg/l peak total chlorine at all four temperatures. Most of the total residual chlorine was in the free form which has a greater toxicity that combined chloramine forms. (Katz)
W77-08761

PHYTOPLANKTON STANDING CROP AND SEWAGE NUTRIENT ENRICHMENT ALONG THE CENTRAL COAST OF LEBANON,
American Univ., Beirut (Lebanon). Dept. of Biology.
J. T. Hardy, and Z. Jubayli.
Environmental Pollution, Vol 11, p 195-202, 1976. 1 tab, 3 fig, 14 ref.

Descriptors: *Primary productivity, *Biomass, *Standing crops, *Phytoplankton, *Domestic wastes, *Sewage effluents, *Seasonal, *Chlorophyll, *Ammonia, *Nitrates, *Nitrites, *Phosphates, *Nutrients, *Productivity, Sewage disposal, Water pollution effects, Environmental effects, Nitrogen compounds, On-site data collections, Sampling.

Identifiers: *Lebanon.

Surface nearshore water samples from seven stations along the central coast of Lebanon were analysed at different seasons for concentrations of nitrate, nitrite, ammonia, phosphate, and chlorophyll-a standing crop. Concentrations of nutrients and chlorophyll-a are higher with a 10 km long coastal zone south of Beirut and increase with decreasing distance from two major untreated sewage outfalls. In some cases, chlorophyll-a standing crops near outfalls are about 10 times greater (at 2.18 mg per cubic meter) than unenriched stations further south or than values reported from elsewhere in the eastern Mediterranean. Near outfalls, concentrations of phosphate, ammonia, and chlorophyll-a tend to be greatest in summer, while nitrate is highest in winter. Preliminary measurements by carbon-14 assimilation indicate that the enriched coastal region has a higher rate of primary production than the unenriched area more than 10 km south of Beirut. (Katz)
W77-08762

FATE OF LABELED N-ALKANES IN THE BLUE CRAB AND STRIPPED MULLET,
University of Southern Mississippi, Hattiesburg. Dept. of Biology.
P. C. Geiszler, B. J. Grantham, and G. J. Blomquist.
Bulletin of Environmental Contamination and Toxicology. Vol 17, No 4, p 463-465, April, 1977. 2 fig, 1 tab, 12 ref.

Descriptors: *Metabolism, *Absorption, *Organic compounds, *Path of pollutants, *Bioassay, *Crabs, *Mullet, *Tracers, Invertebrates, Marine fish, Laboratory test, Analytical techniques, Radiochemical analysis.
Identifiers: *Mugil, *Callinectes, *Tissue analysis.

To examine the differences in the metabolic capabilities of invertebrates and fish, a study on the uptake, discharge and metabolism of long chain n-alkanes in the blue crab Callinectes sapidus and the stripped mullet Mugil cephalus was undertaken. Organisms were exposed to the hydrocarbons either in the test water or by introduction into the digestive tract. After exposure to labeled n-tricosane for 24 hours, an average of 52,000 cpm of labeled hydrocarbon per crab was taken up. Little was retained with averages of 14,000 cpm, 9,000 cpm and 4,000 cpm after 3, 7, and 14 days, respectively. Blue crabs did not metabolize n-alkanes. In contrast, n-alkanes taken up via the digestive tract in mullet were readily metabolized, probably via microorganisms in the gut. More limited metabolism was observed in mullet when n-alkanes were taken up via the gills. (Katz)
W77-08764

TOXICITY TO FISH OF FLAME RETARDANT FABRICS IMMERSED IN THEIR WATER. PART I,
Cornell Univ., Ithaca, N.Y., Dept. of Veterinary Pathology.
G. A. Maylin, J. D. Henion, L. J. Hicks, L. Leibovitz, and V. D. Ahrem.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 499-504, 1977. 3 tab, 6 ref.

Descriptors: *Toxins, *Toxicity, *Bioassay, *Mortality, *Inhibitors, *Bromine, *Phosphorus compounds, *Fish physiology, Laboratory test, Enzymes, Biochemistry, Freshwater fish.
Identifiers: *Flame retardants, *TDBPP, *Tris, *Carassius, Goldfish.

A number of commercial and candidate flame retardants were studied with regard to their toxicity to fish when released from fabrics immersed in their water. Immersion of laundered or unlaundered flame retardant 100% polyester or polyester blend fabrics used in children's sleepwear in water containing goldfish (Carassius auratus) resulted in release of the anticholinesterase flame retardant TDBPP (tris (2,3-dibromopropyl) phosphate) and death of all fish within 24 hours. TDBPP undergoes loss of HBr in water and production of a metabolite. (Katz)
W77-08765

THE RESIDUAL OXYGEN BIOASSAY: A RAPID PROCEDURE TO PREDICT EFFLUENT TOXICITY TO RAINBOW TROUT,
E. V. S. Consultants Ltd., Coquitlam, (British Columbia).
For primary bibliographic entry see Field 5A.
W77-08766

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 7C.
W77-08767

APPLICATION OF TEMPERATURE PREFERENCE STUDIES TO ENVIRONMENTAL IMPACT ASSESSMENT,
Ecological Analysts, Inc., Melville, N.Y.
J. J. Gift.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 746-749. 25 ref. 1977.

Descriptors: *Fish physiology, *Fish behavior, *Thermal pollution, Water pollution effect, Habitat, Laboratory tests, On-site-investigation, Environment, Environmental effects, Thermal power, Thermal power plants, *Thermal water, *Methodology.
Identifiers: *Temperature preference studies, *Environmental impact assessment, *Preference, *Avoidance, Power plant siting.

Increasing use of laboratory and field temperature preference and avoidance data in power plant siting and environmental impact assessment studies has created a need for evaluation and standardization of methodologies. Relevant considerations and applications are discussed. (Katz)
W77-08768

THERMAL ACCLIMATION, UPPER TEMPERATURE TOLERANCE, AND PREFERRED TEMPERATURE OF JUVENILE YELLOWTAIL SNAPPERS, OCVURUS CHRVSURUS (BLOCH) (PISCES: LUTJANIDAE),
Auburn Univ., Ala., Dept. of Fisheries and Allied Aquacultures.
R. K. Wallace, Jr.
Bulletin of Marine Science, Vol. 27, No. 2, p. 292-298, 1977 1 tab., 3 fig., 27 ref.

Descriptors: *Thermal pollution, *Water temperature, *Thermal stress, Thermal water, Bioassay, Laboratory tests, *Mortality, Fish physiology, Fish behavior, Marine fish, Water pollution effects, *Lethal limit, Juvenile fish.
Identifiers: *Thermal acclimation, *Thermal tolerance, Yellowtail snappers, Ocvurus, *Lethal temperature, *Upper thermal tolerance, Lethal temperature, Lower temperature limit, *Preferred temperature.

The rate of acclimation and temperature tolerance of juvenile yellowtail snappers, Ocvurus chrvsurus (Bloch) was tested using the method of sudden exposure to elevated temperature. Acclimations of upto 10 days at various temperatures did not significantly change the 24-hour lethal temperature from that of a 1-day acclimation. Upper thermal tolerance was tested after 3-day acclimations at 20, 24, 28, 30, and 32C. Lethal temperatures (for a 7-day exposure) ranged from 32.6C at a 20C acclimation to 35.5C at a 32C acclimation. No significant relationship was found between acclimation temperature and lethal temperature. The ultimate lethal temperature was estimated to fall between 33.5 and 34C. Acclimation significantly raised resistance times at test temperatures of 34 and 35C. An upper thermal tolerance polygon of 108.8 units was constructed by arbitrarily considering 18C as the lower temperature limit for juvenile yellowtail snappers. Preferred temperature was tested by acclimating and then exposing fish to a horizontal temperature gradient. Acclimation altered the mean preferred temperature, but the preferred temperature remained within the range normally encountered (24-30C) by O. chrysurus. (Katz)
W77-08769

LABORATORY METHODS FOR DETERMINING TEMPERATURE PREFERENCE,
Wilfrid Laurier Univ., Waterloo(Ontario). Dept. of Biology.
R. W. McCauley.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 748-752, 1977. 247 ref.

Descriptors: Laboratory tests, Laboratory equipment, *Fish physiology, *Fish behavior, *Methodology, *Water temperature, Thermal pollution, Thermal properties, Thermal stratification, *Thermal stress, Water pollution effects.
Identifiers: Thermal gradients, *Preferred temperature, Thermoregulation, *Gradient devices, Linear gradient, Tanks, Vertical gradients, Body-temperature telemetry, Calorimetry, *Acclimation.

Different types of temperature-gradient devices used in the laboratory to determine temperature preferences of fish are classified and reviewed. The type of device used seems to have less effect on experimental results than do other variables such as age, size, season, physiological state, or social interactions. (Katz)
W77-08770

METHOD FOR DETERMINING ACUTE TOXICITY OF AN ACID WASTE AND LIMITING PERMISSIBLE CONCENTRATION AT BOUNDARIES OF AN OCEANIC MIXING ZONE,
EG and G Environmental Consultants, Waltham, Mass.
C. D. Rose, W. G. Williams, T. A. Hollister, and P. R. Parish.
Environmental Science and Technology, Vol. 11, No. 4, p. 367-371, April 1977. 3 tab., 3 fig., 10 ref.

Descriptors: *Sea Water, *Toxicity, *Acidic water, *Mortality, *Hydrogen ion concentration, *Lethal limit, *Methodology, *Acid-base equilibrium, *Acidity, *Alkalinity, *Mixing, *Water quality control, Bioassay, Water quality, Alkaline water, Neutralization, Saline water, Laboratory tests, Water pollution control.
Identifiers: *Acid wastes, Acartia.

A new method is described for determining mortality of bioassay organisms attributable to acidic and nonacidic constituents of an acid waste and for using these measurements to derive a limiting permissible concentration for the whole waste at boundaries of an oceanic mixing zone. The method reports mortality attributable to the acidic constituent in terms of its direct cause--hydrogen ion concentration of bioassay water. Titration of acid waste into a representative sample of seawater from the mixing zone is then performed to obtain a limiting permissible concentration for the whole waste that recognizes the dominant role of neutralization in reducing concentration and toxicity of the acidic constituent in the zone. The method, which is demonstrated for a by-product hydrochloric acid with the copepod Acartia tonsa as the bioassay organism, can be modified for use with alkaline wastes. (Katz)
W77-08771

THE EFFECT OF THE IMPOUNDMENT OF LAKE KAINJI, NIGERIA, ON THE INDIGENOUS SPECIES OF MORMYRID FISHES,
Reading Univ. (England). Dept. of Zoology.
B. F. Blake.

Freshwater Biology, Vol. 7, p. 37-42, 1977. 2 tab., 4 fig., 6 ref.

Descriptors: *Impoundments, *Rivers, *Lakes, *Fish populations, *Biological communities, *Environmental effects, *Seasonal, On-site data collections, Fish reproduction, Sampling, Nocturnal, Commercial fish.
Identifiers: *Mormyrids, *Species composition, *Lake Kainji(Nigeria), *Niger River, *Gnathonemus.

Changes in the numbers and species composition of mormyrid fishes since the impoundment of the Niger (Lake Kainji) are analysed. An initial decline after impoundment appears to have been reversed and these fish are now increasing. The increase is, however, restricted to a few species only; many forms common to the river are still declining or have disappeared altogether. Marked seasonal variations in abundance are described and possible explanations discusses. (Katz)
W77-08772

TOXICITY, ACCUMULATION, AND RELEASE OF THREE POLYCHLORINATED NAPHTHALENES (HALOWAX 1000, 1013, AND 1099) IN POSTLARVAL AND ADULT GRASS SHRIMP, PALAEMONETES PUGIO,
Texas A and M Univ., College Station. Dept. of Biology.
F. A. Green, Jr., and J. M. Neff.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 4, p. 399-407, April 1977. 3 tab., 2 fig., 13 ref.

Descriptors: *Lethal limit, *Toxicity, *Absorption, *Bioassay, *Organic compounds, *Chlorination, *Water pollution effects, *Shrimp, *Mortality, *Growth stages, Laboratory tests, Path of pollutants, Metabolism, Larvae, Invertebrates.
Identifiers: *Polychlorinated naphthalenes, *Halowax, *Bioconcentration, Palaemonetes pugio, *Grass shrimp.

Adult and postlarval grass shrimp, Palaemonetes pugio, were exposed to Halowax 1000, 1013, and 1099, three polychlorinated naphthalenes. In toxicity tests, Halowax 1099 (trichloro-and tetrachloronaphthalenes) was more toxic to grass shrimp than Halowax 1000 (monochoro and dichloronaphthalene). Postlarvae were less tolerant than adults to Halowax 1099 and 1013, but were more tolerant to Halowax 1000 than the adults. Halowax 1099 was concentrated in the tissues of adult grass shrimp to a level 257 times greater than the exposure concentration, whereas Halowax 1013 and 1000 reached magnification factors of 187x and 63x, respectively. The degree to which the different compounds were accumulated corresponded to their relative degree of toxicity. This could be directly related to the relative ability of the shrimp to metabolize or excrete PCN's of different chlorine content. (Katz)
W77-08773

A STUDY OF HEAVY METALS IN LAKE ABBAYA, ETHIOPIA, AND THE INCIDENCE OF NON-PARASITIC ELEPHANTIASIS,
London Univ. (England). Dept. of Pharmaceutics.
For primary bibliographic entry see Field 5A.
W77-08774

STUDY ON THE POST-MORTEM IDENTIFICATION OF POLLUTANTS IN THE FISH KILLED BY WATER POLLUTION: DETECTION OF ARSENIC,
South Carolina State Coll., Orangeburg. Water Lab.
For primary bibliographic entry see Field 5A.
W77-08775

THE EFFECT OF TWO PESTICIDES, MIEDZIAN 50 AND GESAGARD 50, ON THE DEVELOPMENT OF TADPOLES OF RANA TEMPORARIA,
Polish Academy of Sciences, Krakow. Dept. of Experimental Zoology.
M. Jordan, K. Rzehak, and A. Maryanska.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p. 349-354, 1977. 4 fig., 10 ref.

Descriptors: Animal physiology, *Water pollution effects, *Growth stages, Animal growth, *Immature growth stage, *Frogs, *Toads, Environmental effects, Animal pathology, *Toxicity, *Pesticides, Amphibians, Aquatic animals, Mode of action, Copper compounds, Agricultural chemicals, Pesticide residues.
Identifiers: *Miedzian 50, *Gesagard 50, Rana temporaria, *Tadpoles.

Tadpoles of the frog, Rana temporaria, in two developmental stages were subjected to the action of aqueous suspensions of two pesticides-Miedzian 50 (basic cupric chloride) and Gesagard 50. The changes caused these substances pertain chiefly to the alimentary canal, brain, and muscles, as shown by microscopic inspection of cross-sections, and are connected with the developmental stage of the animals. Miedzian 50 caused a partial cytolysis in the cells of the intestinal epithelium and the parenchyma of the liver. Gesagard 50 was more toxic. Strong degenerative changes were observed in the alimentary canal and the brain. Developmental disorders were also observed, consisting of a partial growth inhibition and a retardation of the process of completion of the operculum as compared with control animals. (Katz)
W77-08776

THE ACCUMULATION OF POLYBOMINATED BIPHENYLS BY FISH,
Fisheries and Marine Service, St. Andrews (New Brunswick). Biological Station.
V. Zitko.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 3, p 285-292, 1977. 1 fig, 5 tab, 11 ref.

Descriptors: *Bromine, *Halogenated pesticides, *Bioassay, *Absorption, *Salmonids, *Pesticide residues, Aroclor, Chlorinated hydrocarbon pesticides, Polychlorinated biphenyls, Path of pollutants, Laboratory tests, Atlantic salmon, Persistence, Analytical techniques.
Identifiers: *Polybrominated biphenyls, BP-6, OB.

The accumulation of commercial polybrominated biphenyls (PBBs), BP-6 (Michigan Chemical Corporation) and OB (The Dow Chemical Company), from water and from food by juvenile Atlantic Salmon (Salmo salar) was determined and compared with that of Aroclo 1254. Only bromobiphenyls with six or fewer bromine atoms were accumulated from water by the fish. When administered in food, more brominated biphenyls were taken up as well. Bromobiphenyls with up to four bromine atoms resemble corresponding chlorobiphenyls, while the more substituted bromobiphenyls are less accumulated from water than corresponding PCBs. The accumulation of these bromobiphenyls from food is higher or equal to that of Aroclor 1254. The highly substituted bromobiphenyls are debrominated in the fish, a reaction which may have toxicological consequences not encountered with PCBs. (Katz)
W77-08777

EUTROPHICATION OF AN IMPOUNDED ESTUARINE LAGOON,
Tasmania Univ., Hobart (Australia). Dept. of Zoology.
R. E. Buttermore.
Marine Pollution Bulletin, Vol 8, No 1, p 13-15, January 1977. 4 fig, 15 ref.

Descriptors: *Sewage, *Water pollution effects, *Lagoons, *Estuaries, *Eutrophication, *Impoundments, *Odor, *Odor-producing algae, *Decomposing organic matter, *Water quality, *Mussels, Aquatic productivity, Biological communities, Mollusks, Fishkills, Crustaceans, Heavy metals, Agricultural runoff, *Australia.
Identifiers: *Estuarine lagoon, *Tasmania.

A small lagoon to the east of Hobart is cut off from a larger body of tidal salt water by a causeway, allowing only a limited tidal interchange. Primary treated effluent from a small township is discharged into the lagoon. Causes for noxious odors emanating from the lagoon were investigated. It was found that the effluent, combined with agricultural runoff, has accelerated eutrophication. Wide variations in temperature and salinity occur. Decomposing algal mats account for most of the odors, while rooted aquatics and molluscs appear to play only a small part. Proposed remedies will be costly and still might not achieve their objectives. (Katz)
W77-08778

DEVELOPMENT OF A BLOOD SUGAR BIOASSAY FOR RAPIDLY MEASURING STRESSFUL LEVELS OF PULPMILL EFFLUENT TO SALMONID FISH,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
For primary bibliographic entry see Field 5A.
W77-08779

AVOIDANCE OF BLEACHED KRAFT PULPMILL EFFLUENT BY PINFISH (LAGODON RHOMBOIDES) AND GULF KILLIFISH (FUNDULUS GRANDIS),
Florida State Univ., Tallahassee. Dept. of Biological Sciences.
F. G. Lewis, III, and R. J. Livingston.
Journal of the Fisheries Research Board of Canada, Vol 34, p 568-570, 1977. 1 fig, 12 ref.

Descriptors: *Fish behavior, Fish physiology, *Water pollution effects, Laboratory tests, *Industrial wastes, *Pulp wastes, *Pulp and paper industries, Methodology, Laboratory technique, *Killifishes, Statistical methods.
Identifiers: *Bleached kraft pulpmill effluent, *Gradient trough, *Avoidance, Gulf killifish, Steep gradient trough, *Avoidance response, *Pinfish.

Avoidance of bleached kraft pulpmill effluent (BKME) by fish was investigated in a steep gradient trough. No significant difference was found between the responses of the two species. No avoidance was recorded at 0.01% BKEM, while both species displayed a significant, yet low avoidance at 0.1% BKME. A marked avoidance was observed for both species at 1.0% and 10.0% BKME. In both species the threshold avoidance level was estimated to be 0.06% BKME. (Katz)
W77-08780

STUDIES ON MERCURY CONTENT IN SELECTED FISH SPECIES FROM POMERANIAN GULF AND SZCZECIN FIRTH (BADANIA NAD ZAWARTOSCIA RTECI OGOLNEJ W WYBRANYCH GATUNKACH RYB ZATOKI POMORSKIEJ I),
Institute of Marine Food Technology, Szczecin (Poland).
A. Chodyniecki, M. Kurpios, M. Protasowicki, A. Ociepa, and J. Juran.
Acta Ichthyologica et Piscatoria, Vol 5, No 1, p 51-57, 1975. 1 tab, 2 fig, 16 ref.

Descriptors: *Mercury, *Absorption, *Heavy metals, *Path of pollutants, *Eels, *Herrings, Public health, Water pollution control, Industrial wastes, Marine fish, Biochemistry, Physiology.
Identifiers: Bioconcentration, Tissue analysis, Muscle tissue, *Cod, Gadus, Clupea, Anguilla,

Lucioperca, *Poland, Pomeranian Gulf(Poland), Szezecin Firth(Poland).

Determinations were made on mercury content in muscles of cod and herring from Pomeranian Gulf and of pikeperch and eel from Szczecin Firth. Additionally, the level of Hg was measured in liver and kidneys of selected cod and herring. Mercury content in muscle tissues ranged from 0.00 to 0.37 mg/kg with the highest concentrations found in two eels and two pikeperch, at 0.25, 0.37, 0.35 and 0.21 mg/kg, respectively. The highest average mercury content was 0.11 mg/kg found in eel muscle tissue. Mercury accumulation in cod and herring livers was higher than in muscle tissues. Mercury accumulation in herring kidney was 1.5 times higher than in muscles. (Katz)
W77-08781

THE INFLUENCE OF SOME POLLUTANTS ON THE SURVIVAL OF EGGS AND LARVAE OF TWO SPECIES OF FLATFISH, LIMANDA YOKOHAMAE AND PARALICHTYS OLIVACEUS, (IN JAPANESE),
Y. Yasunaga.
Bulletin of the Tokai Regional Fisheries Research Laboratory, No 86, p 81-112, 1976. 5 tab, 15 fig, 17 ref.

Descriptors: *Larvae, Pollutants, *Toxicity, *Water pollution effects, *Mortality, *Fish eggs, *Lethal limit, *Mercury, *Bioassay, *Phosphates, *Sulfates, Ammonium salts, Hydrogen ion concentration, Growth stages, Surfactants, Phenols, Nitrates.
Identifiers: Limanda, Paralichtys, *Flatfish, Japan.

Laboratory tests were conducted to determine the toxicity and effects of various pollutants on eggs and larvae of flatfish species, Limanda yokohamae and Paralichtys olibaceus. In addition, relationship between survival and hydrogen ion concentration was examined. The TLM values for phosphate ion, nitrate ion and phenol ranged between 100-1, 100 ppm. Ammonia ion, sulphate, mercury and anionic surface active agent were found to be fairly toxic with TLM values ranging between 0.05-0.5 ppm. Nonionic surface active agent was mildly toxic to larvae but it caused a high rate of deformity in hatching even at low concentrations of 10-15 ppm for L. yokohamae and of 0.05 ppm for P. olivaceus. (Katz)
W77-08782

POLYCHLORINATED BIPHENYLS IN ADULT MAYFLIES (HEXAGENIA BILINEATA) FROM THE UPPER MISSISSIPPI RIVER,
Fish and Wildlife Service La. Crosse, Wis. Fish Pesticide Research Unit.
W. L. Mauck, and L. E. Olson.
Bulletin of Environmental Contamination and Toxicology, Vol 17, No 4, p 387-390, April 1977. 1 fig, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Aroclor, *Path of pollutants, *Food chains, *Mississippi River, *Mayflies, *Pesticide residues, *Absorption, *Bioindicators, Invertebrates, Aquatic insects, Food webs, Pollutant identification, Public health, Fish food organisms.

The burrowing mayfly (Hexagenia bilineata), an important natural fish food in the upper Mississippi River, was collected from 14 sample sites to determine levels of the PCB, Aroclor 1254. Adult mayflies from all stations contained significant residues of Aroclor 1254 with the highest concentrations (about 2.5 micrograms per gram, whole body weight) in mayflies collected from Lake Pepin. Similar trends were found in fish collected from the same stations, sugesting the contribution of mayflies to PCB levels in fish by way of the food chain. The adult mayfly may be a useful indicator of chemical residue trends in the Upper Mississippi because of its abundance and ease of collection. (Katz)
W77-08783

ACID MINE DRAINAGE (AMD) AND ITS IMPACT ON A SMALL VIRGINIA STREAM,
Virginia Polytechnic Inst. State Univ., Blacksburg. Dept. of Civil Engineering.
R. C. Hoehn, and D. R. Sizemore.
Water Resources Bulletin, Vol 13, No 1, p 153-160, February 1977. 2 fig, 15 ref.

Descriptors: *Water pollution sources, *Mortality, *Hydrogen ion concentration, *Acid mine water, *Mine drainage, *Mine wastes, *Benthic fauna, *Iron compounds, *Bioassay, Fish, *Snails, *Toxicity, *Virginia, Acid water, Water pollution effects, Environmental effects, Water quality, Chemical properties, Iron, Pollutants.
Identifiers: *Chestnut Creek(Virginia).

A study was conducted to chemically characterize three AMD streams entering Chestnut Creek in southwestern Virginia and to assess the biological and chemical alterations in the creek. Over a six mile reach, the benthic macroinvertebrate population was reduced to zero, the natural low alkalinity (25 mg/1) of the stream was reduced to less than 5 mg/1, and the pH was reduced from 7.2 to 6.3. Increased concentration of iron from less than 0.01 mg/1 to more than 4.0 mg/1 was accompanied by the deposition of a coating of iron hydroxide up to 0.25 inches thick in the stream bed, which is probably responsible for the absence of benthic macroinvertebrates. In situ bioassays with bluegill sunfish and one snail species showed that the creek water, after confluence with AMD streams, was not toxic in 192 hours to fish, and snails survived 96 hours before they began to die. Undiluted AMD was highly toxic. (Katz)
W77-08784

EFFECTS OF DIPOTASSIUM ENDOTHALL ON ROOTED AQUATICS AND ADULT AND FIRST GENERATION BLUEGILLS,
Wisconsin Dept. of Natural Resources, Woodruff.
S. L. Serns.
Water Resources Bulletin, Vol. 13, No. 1, p. 71-80, February 1977. 5 tab., 15 ref.

Descriptors: *Sunfishes, *Aquatic plants, *Fish reproduction, *Growth rates, *Herbicides, *Growth stages, Path of pollutants, Pesticide residues, *Aquatic weed control, Pesticides, Absorption, Mortality.
Identifiers: *Endothall, Myriophyllum, Ceratophyllum, Potamogeton, Anacharis.

A 0.31-ha pond was treated with 5.0 mg/1 dipotassium endothall and the effects of this treatment on the rooted aquatics, on bluegill reproduction, survival, and growth, and on the buildup of endothall residues in bluegill flesh was investigated. The treatment eliminated Myriophyllum exalbescens, Ceratophyllum demersum, Potamogeton crispus, and Anacharis canadenis during the first season, however, all but C. demersum became reestablished the following year. Little endothall was incorporated into edible bluegill flesh. The dipotassium endothall did not affect the number of young-of-the-year bluegills produced by the original adult stocking during the year of treatment and the year following treatment and did not affect the reproduction of first generation bluegills. The survival of adult and first generation bluegills was not affected by the herbicide. Bluegills were slower growing in the treatment than the control pond, when similar densities were present in each pond. It is not known whether this was due to some unknown effect of the dipotassium endothall or to other factors. (Katz)
W77-08785

EFFECTS OF SUBLETHAL CONCENTRATIONS OF THE HERBICIDE ATRAZIN ON GROWTH AND REPRODUCTION OF DAPHNIA PULEX,
Freiburg Univ. (West Germany). Limnologisches Institut.
U. Schober, and W. Lampert.
Bulletin of Environmental Contamination and Toxicology, Vol. 17, No. 3, p. 269-277, 1977. 5 fig., 4 tab., 7 ref.

Descriptors: *Bioassay, *Bioindicators, *Water pollution effects, Environmental effects, *Mortality, *Reproduction, *Herbicides, *Growth rates, Longevity, Laboratory tests, Methodology, *Daphnia zooplankton.
Identifiers: *Atrazin, *Sublethal effects.

Young Daphnia pulex were exposed to the herbicide Atrazin, an inhibitor of photosynthesis, in experiments designed to provide information on changes in reproduction and growth at sublethal doses. In 28 day tests, reproduction was significantly affected at 1 ppm. With increasing Atrazin concentrations growth was reduced as evidenced by mean length and carbon concentration. The greatest reduction (53.7%) occurred between 1 and 5 mg Atrazin/l. Experiments lasting 70 days, the approximate life span of Daphnia, showed no effect on longevity. Various problems associated with testing for sublethal effects of pollutants are discussed.
W77-08786

CONCENTRATIONS OF PCBS, DIELDRIN AND DDT RESIDUES IN MARINE ANIMALS FROM LIVERPOOL BAY,
Liverpool Univ. (England). Dept. of Oceanography.
J. P. Riley, and S. Wahby.
Marine Pollution Bulletin, Vol. 8, No. 1, p. 9-11, January 1977. 2 tab., 11 ref.

Descriptors: *Polychlorinated biphenyls, *Dieldrin, *DDT, *Absorption, *Sewage sludge, *Sewage disposal, *Mollusks, *Benthic fauna, *Crustaceans, *Pesticide residues, *Marine fish, Chlorinated hydrocarbon pesticides, Path of pollutants, Bays.
Identifiers: *Liverpool Bay(England), *Bioaccumulation, Irish Sea.

The levels of DDT residues, dieldrin and PCBs have been determined in the tissues of fifteen species of marine animals from the Liverpool Bay area of the Irish Sea. In general, the concentrations of these compounds are lower than those reported earlier for fish from other British inshore areas, depsite the fact that the Bay is subject to pollution, not only from the River Mersey, but also from extensive sewage sludge dumping. The level of the compounds in the sampled organisms were below those which present a hazard to man. These low levels may reflect recent controls on the use of these compounds.
W77-08788

SOME EFFECTS OF OIL DISPERSANTS ON THE FEEDING BEHAVIOUR OF THE BROWN SHRIMP, CRANGON CRANGON,
Southampton Univ. (England). Dept. of Oceanography.
G. W. Evans, M. Lyes, and A. P. M. Lockwood.
Marine Behaviour and Physiology, Vol. 4, p. 171-181, 1977 4 fig, 12 ref.

Descriptors: *Oil, *Oil pollution, *Water pollution effects, *Shrimp, Marine animals, Commercial shellfish, *Animal behaviour, Animal physiology, Feeding rates, Bioassay, Laboratory tests, *Oil spills.
Identifiers: Brown shrimp, Crangon, *Oil dispersants, *Tween 80, *BP 1100X, *Slickgone LT2, Food detection, Food consumption.

Concentrations in the range 1 ppm - 100 ppm of Tween 80, BP 1100X and Slickgone LT2 in sea water are shown to decrease both the food con-

sumption of the shrimp, Crangon crangon, and the ability of the animal to select the arm of a Y-maze which contains food extract. The ability to locate food is largely recovered within four hours of return of the animals to clean sea water after prior exposure to 10 ppm Tween 80, 10 ppm BP 1100X or 10 ppm Slickgone LT2. (Katz)
W77-08790

EFFECTS OF A PARASITE, EUBOTHRIUM SALVELINI (CESTODA: PSEUDOPHYLLIDEA), ON THE RESISTANCE OF JUVENILE SOCKEYE SALMON, ONCORHYNCHUS NERKA, TO ZINC,
Fisheries and Marine Service, Nanimo (British Columbia). Biological Station.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 706-709, 1977. 1 fig, 12 ref.

Descriptors: *Zinc, *Metals, *Fish diseases, Water pollution effects, *Sockeye salmon, Toxicity, Salmon, Freshwater fish, Laboratory tests, Lakes, Bioassay, *Fish parasites.
Identifiers: British Columbia, Babine Lake, *Tapeworm, Eubothrium, *Biological stressors, Intestinal cestodes.

Most research to date on the tolerance of natural populations to physical and chemical stressors appears to have overlooked that parasites may themselves be stressors, and that they may be capable of modifying the resistance of the host to other applied stressors. Sockeye salmon (Oncorhynchus nerka) smolts trapped at the outlet of Babine Lake, central British Columbia, were subjected to 1 mg/l dissolved zinc under laboratory conditions. Smolts infected with the intestinal cestode Eubothrium salvelini proved to be significantly more susceptible to zinc than were noninfected smolts. We recommend that future investigations of environmental effects, especially on wild populations, include consideration of the state of parasitism of the test organisms. (Katz)
W77-08791

ALGAL UPTAKE OF COPPER FROM COMPOUNDS AND ITS EFFECT ON SALT METABOLISM IN ALGAE,
Moscow State Univ. (USSR).
V. G. Khobot'yev, V. I. Kapkov, Ye. G. Rukhadze, N. V. Turunina, and N. A. Shidlovskaya.
Hydrobiological Journal, Vol. 12, No. 1, p. 29-34, 1976 2 tab., 1 fig., 7 ref.

Descriptors: *Copper, *Metals, Algae, *Phytoplankton, Biochemistry, Physiology, *Water pollution effects, Path of pollutants, Toxicity, Bioassay, Potassium, Herbicides, *Algicides, *Absorption.
Identifiers: *Algal copper uptake, Copper compounds, *Inorganic copper, Salt metabolism, *Biocides, Protococcal algae, Toxicity mechanism.

The dynamics of algal copper uptake from media containing various copper concentrations was studied. A direct relationship was found between the copper accumulation by the cells and algicidal action of a given compound. The high biocidal activity of copper complexes is due to the ability of the cells to take up large quantities of copper from compounds with a coordination bond between the metal and the ligand. Toxic (0.78 x 10 to the 5th power to 7.8 x 10 to the 5th power M) concentrations of copper complexes disturb salt metabolism in algal cells due to copper accumulation or potassium loss. If the concentration of a copper compound with a coordination bond is 7.8 x 10 to the 5th power M, the content of potassium in the algal cells decreases by 80% within 30 to 60 min. (Katz)
W77-08792

ECOLOGY OF TOXICITY IN MARINE SPONGES,
Universidad Nacional Autonoma de Mexico, Mexico City. Centro de Ciencias del Mar y Limnologia.
G. Green.
Marine Biology, Vol. 40, p. 207-215, 1977 3 tab., 21 ref.

Descriptors: *Toxicity, *Marine animals, North America, Washington, Mexico, Bioassay, *Invertebrates, Geographical regions, Latitudinal studies, Methodology, California, Fish food organisms, Fish diets, Fish diseases, *Fish repellents, *Fish toxins, Marine fish, Fish behavior.
Identifiers: Force feeding experiments, *Sponges, *Sponge species, San Juan Island, Santa Catalina Island, *Toxic sponge extract.

An investigation of the ecology of toxicity in marine sponges from different latitudes on the North American continent was made. Results indicated that toxicity in sponges increased with decreasing latitude. Three of the 34 species (9%) of sponges from San Juan Island, Washington, USA (48oN), were toxic to fishes. Nine of the 44 species (20%) of sponges from Santa Catalina Island, California, USA (33oN), were toxic. Seven of the 11 species (64%) of sponges from Zihuatanejo Bay, Guerrero, Mexico (17oN), were toxic. Twenty-seven of the 36 species (75%) of sponges from La Bianquilla, Veracruz, Mexico (19oN), were toxic. Most of these toxic sponges are openly exposed to fishes. The most common exposed sponges proved to be highly toxic to fishes. Force-feeding experiments conducted with wrasses demonstrated the effectiveness of the toxin of sponges. A hypothesis is proposed which explains the relationship between species diversity of fishes and sponge toxicity with latitude. (Katz)
W77-08793

EFFECT OF THE WATER-SOLUBLE FRACTIONS OF CRUDE, REFINED AND WASTE OILS ON THE EMBRYONIC AND LARVAL STAGES OF THE QUAHOG CLAM MERCENARIA SP.,
Florida State Univ., Tallahassee. Dept. of Oceanography.
C. J. Byrne, and J. A. Calder.
Marine Biology, Vol. 40, p. 225-231, 1977 3 tab., 31 ref.

Descriptors: *Oil wastes, Spills, *Toxicity, Bioassay, Laboratory tests, *Mollusks, *Clams, Marine animals, Embryonic growth stage, *Larvae, Larval growth stage, Water pollution effects, Water pollution sources, Water quality, Methodology.
Identifiers: *Quahog clam, Mercenaria sp., *Crude oil, *Refined oil, *Waste oils, *Water-soluble fractions, Kuwait crude, Southern Louisiana Crude, Florida Jay Crude, LC50, *Used motor oil.

The embryonic and larval stages of the quahog clam Mercenaria sp. were exposed to the water-soluble fractions (WSFs) of 6 oils and the effects on survival and growth rate of the various stages were noted. Kuwait crude oil was the least toxic on initial exposure to both stages, having LC50 values in excess of 10 ppm after continuous exposure to the WSF for up to 6 days. However, at 10 days, Kuwait was slightly more toxic than Southern Louisiana crude oil, with both oils having LC50 values near 2 ppm. Florida Jay crude oil was much more toxic, with an LC50 of less than 1 ppm at 48 h and less than 0.2 ppm at 10 days. Two refined oils, No. 2 fuel oil and Bunker 'C', had LC50 values of 1 to 2 ppm after 48 h, while used crankcase motor oil, the most toxic oil tested, had LC50 values of 0.10 ppm or less at all exposure times. Larvae surviving exposure to water-soluble fractions of the various oils often grew at slower rates than the controls. (Katz)
W77-08794

A CERTAIN MARINE CATENATE DINOFLAGELLATE TENTATIVELY APPLIED FOR DETECTING CARCINOGENS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
For primary bibliographic entry see Field 5A.
W77-08795

INCORPORATION OF BENZATHRONE INTO THE NUCLEI OF GYRODINIUM SP. AND THE HEREDITY OF CONSEQUENT MITOTIC DELAYS,
Kyushu Univ., Fukuoka (Japan). Lab. of Fisheries and Chemistry.
S. Ishio, J. C. Chen, and N. Ohba.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 43, No. 3, p. 289-299, 1977 3 tab., 1 fig., 19 ref.

Descriptors: *Organic compounds, Organic waste, *Oil pollution, *Marine algae, *Phytoplankton, Path of pollutants, *Water pollution effects, Biochemistry, Methodology, *Genetics, Nutrients, Herbicides.
Identifiers: *Gyrodinium, Benzathrone-3H, *Bioconcentration, Gyrodinium nuclei, *Mitotic delays, Heredity.

Benzathrone added to ASP2NTA medium was incorporated in a short period, mainly into the thecae and the crude nuclei of Gyrodinium sp. The benzathrone incorporated into purified nuclei was less, but its concentration amounted to 800 times as large as the initial 1 ppm concentration of the medium. Benzathrone in purified nuclei was extremely hard to remove and was presumed to intercalate between DNA base pairs. Since Gyrodinium sp. was separated from the medium containing benzathrone continued to propagate, showing mitotic delays over three to five generations at least in the normal medium, the mitotic delay caused by benzathrone was concluded to be of a hereditary nature. (Katz)
W77-08796

METHOXYCHLOR RESIDUE STUDIES IN CAGED AND WILD FISH FROM THE ATHABASCA RIVER, ALBERTA, FOLLOWING A SINGLE APPLICATION OF BLACKFLY LARVICIDE,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
W. L. Lockhart, D. A. Metner, and J. Solomon.
Journal of the Fisheries Research Board of Canada, Vol. 34, p. 626-632, 1977 3 tab., 18 ref.

Descriptors: *On-site-investigation, *Insecticides, *Chlorinated hydrocarbon pesticides, Aquatic insects, Laboratory tests, Rainbow trout, Freshwater fish, Suckers, Minnows, *Monitoring, Water pollution effects, *Toxicity, Bioassay, *Larvicide, *Pesticide residues, Pollutant identification.
Identifiers: *Methoxychlor, *Residue studies, Athabasca River, Alberta, *Blackfly larvicide, Catostomus, Hybopsis, Tissue residue, Pesticide residues.

On June 4, 1974, the Athabasca River was treated with methoxychlor for control of blackfly larvae. Pesticide was introduced into the water in a manner calculated to generate a 15-min pulse of treated water containing 300 microgram methoxychlor/l. A preliminary experiment with rainbow trout (Salmo gairdneri) indicated that liver of kidney residues of methoxychlor would be suitable for monitoring likely times and places to expect toxic effects on fish in the river. Fish (Salmo gairdneri, Catostomus commersoni, C. Catostomus, and Hybopsis gracilis) were caged in order to observe residues and mortality. Caged fish were not killed by methoxychlor but they contained lower liver residues than wild fish of the same species captured near cages. Contaminated wild fish were found upstream of the treatment site after treatment. Residues were below detection limits by

June 16. Residue measurements suggested that the most likely times to expect fish poisoning were the 2 wk following treatment and that the most likely places were those river areas extending a few kilometers in both directions from the point of application. Evidence of fish movements and low pesticide residues in caged individuals reduced confidence in residue methods as monitoring tools. (Katz)
W77-08797

OPTIMAL TEMPERATURE FOR GROWTH OF JUVENILE BLUEGILLS,
Environmental Research Lab-Duluth, Minn.
A. E. Lemke.
The Progressive Fish Culturist, Vol. 39, No. 2, p. 55-57, April 1977 1 tab., 14 ref.

Descriptors: Freshwater fish, *Sunfishes, *Water temperature, *Thermal stress, Laboratory tests, Methodology, Juvenile fish, Bioassay, Water quality, *Growth rates, *Aquiculture, Fish physiology, Statistical methods.
Identifiers: *Constant temperature test, *Specific growth rate.

Juvenile bluegills, Lepomis macrochirus (initial weight, 1.8-8.0 g) were individually marked and fed to excess during a 30-day constant temperature test; day length was 16 h. Fish were tested at temperature intervals of 2 deg. from 20 to 36 C. The highest specific growth rate occurred at 30 C (2.35%/day); however, growth rates of only the groups held at 20 C and 36 C were statistically different from the rate for the group held at 30 C. (Katz)
W77-08798

BEHAVIORAL STUDIES ON CHEMORECEPTION IN BALANUS HAMERI,
University Coll. of North Wales, Menai Bridge. Marine Science Labs.

Descriptors: *Animal behaviour, Animal physiology, Animal populations, Benthos, *Marine animals, *Feeding rates, Feeds, Bioassay, Biochemistry, Methodology, Laboratory tests, *Hydrogen ion concentration, Amino acids.
Identifiers: *Barnacles, Balanus, Amino acids, *Feeding behaviour, Threshold, l-glutamic acid, Glycine, *Feed response, *Algae extracellular products, *Chemoreception.

Solutions of amino-acid and some related compounds were found to release feeding behaviour in Balanus hameri. The lowest threshold was to a-glutamic acid (2.3 x 10 to the 5th power M) followed by glycine (4.5 x 10 to 5th power M) followed by glycine (4.5 x 10 to the 4th power M). The experiments suggest that the animals can distinguish the isomers of glutamic acid. Strong feeding responses were also obtained from the Iripeptide, reduced glutathione (5 x 10 to the 4th power M). Solutions of glycollic acid, an extracellular product of some algae, were only weakly stimulatory. Acidic and alkaline solutions in the ranges pH 1-3.5 and 9.5-13 also evoked apparent feeding responses, but the pH of the solution had no observable effect in the range of 5-9.5. (Katz)
W77-08799

PHYSIOLOGICAL AND BEHAVIORAL REACTIONS OF FISHES TO TEMPERATURE CHANGE,
Yale Univ., New Haven. School of Medicine.
L. I. Crawshaw.
Journal of the Fisheries Research Board of Canada, Vol 34, p 730-734, 1977. 2 fig, 45 ref.

Descriptors: Fish, *Fish physiology, Fish behavior, *Themal pollution, *Water pollution effects, *Thermal power, Thermal stress, Thermal water, Temperature, Trout, Salmon.
Identifiers: *Temperature change, *Behavioral responses, *Physiological responses, Temperature regulation, *Physiological temperature optima, Acute effects, Peripheral temperature change, *Thermal exchange, Respiratory homeostasis, Thermal acclimation.

Teleost fishes possess a central nervous system thermoregulatory mechanism remarkably similar to that of other vertebrates. Inputs from peripheral and anterior brainstem thermosensitive elements are integrated to effect appropriate thermoregulatory responses. The integrated output signal from the thermoregulatory center also appears to provide an input to the respiratory system. Short-term deviations from a given temperature alter respiratory requirements, produce acid-base imbalance, and cause disturbances in fluid-electrolyte regulation. Acclimation to a given temperature involves changes that counteract these disturbances. (Katz)
W77-08802

EFFECT OF HOT EFFLUENT DISCHARGE FROM THE KONAKOVO POWER PLANT ON THE GROWTH OF BREAM IN IVAN'KOVO RESERVOIR,
Vserossiiskii Nauchno-Issledovatelskii Institut Prudovogo Rybnogo Khozyaistva, Moscow (USSR).
G. B. Sappo.
Hydrobiological Journal, Vol 11, No 6, p 43-47, 1975. 3 tab, 2 fig, 14 ref.

Descriptors: *Heated water, *Environmental effects, *Growth rate, *Water pollution effects, *Water temperature, *Freshwater fish, *Biomass, *Metabolism, Temperature, Fish reproduction, Powerplants, *Thermal pollution, Thermal water, Populations, Adaptation, Benthos, Feeding rates.
Identifiers: *Bream, *Ivan'kovo Reservoir(USSR).

The effect of a heated water effluent on the growth rate of bream in the Ivan'kovo Reservoir was determined by sampling fish from control stations, from a station strongly affected by the heated water and from a station slightly affected by the heated effluent. The most rapid growth rate was found in fish from the area slightly affected by heated water, followed by fish from the control area. The fish with the slowest growth rate came from the area strongly affected by heated water. Even though this group of fish showed a higher feeding rate and the biomass of benthos was greater, the increased metabolic rate due to high temperatures were not satisfied by the food intake. Bream in areas with higher water temperatures were found to mature at smaller sizes. (Katz)
W77-08803

THE EFFECT OF WARM EFFLUENT FROM THE NOVOROSSIYSK THERMAL POWER PLAN ON ZOOPLANKTON,
Kuban State Univ., Novorossisk (USSR). Marine Biology Research Station.
L. I. Goryaynova.
Hydrobiological Journal, Vol 11, No 6, p 19-23, 1975. 2 tab, 9 ref.

Descriptors: Populations, *Biomass, *Zooplankton, *Heated water, *Seasonal, *Water temperature, Water pollution effects, *Larvae, *Copepods, Environmental effects, *Thermal pollution, Bays, Powerplants, Temperature, Invertebrates, Plankton.
Identifiers: *Black Sea, *Species composition, *Novorossiysk Bay(Black Sea).

Novorossiysk Bay in the Black Sea was the site of an investigation to determine the yearly pattern of species composition and distribution of zooplankton in a thermal powerplant discharge. The mean annual temperature in the area near the discharge of the heated effluent was 1.30C higher than at the control station. During the winter season the species composition of the zooplankton in the effluent zone was more diverse that at the control station. In the spring 17 species of zooplankton were found in the effected areas as compared to 11 species in the control area. In the summer and fall more species were found in control areas because 'cold-loving' species avoided warmer water. A higher concentration of copepod nauplii and larvae of bottom organisms was observed in the warm-water zone. The average annual abundance and biomass of the zooplankton in the warm water zone was almost double those at the control station. (Katz)
W77-08804

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

EVALUATION OF NITRIFICATION IN THE WATER COLUMN OF THE PASSAIC RIVER,
Rutgers - The State Univ., New Brunswick N. J. Dept. of Environmental Science.
M. S. Finstein, J. Cirello, P. F. Strom, M. L. Morris, and R. A. Rapaport.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 859, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, Rutgers University, Water Resources Research Institute, April 1977. 41 p, 4 tab, 16 fig, 20 ref. OWRT A-053-NJ(1), 14-34-0001-7063.

Descriptors: *Nitrification, *Waste assimilative capacity, Water quality standards, *New Jersey, Evaluation, Oxygen demand, Nitrogen cycle, Sampling, Nutrients, Ammonium.
Identifiers: *Nitrifying bacteria, *Nitrogenous biochemical oxygen demand, *Passaic River(NJ), Microbial ecology, Substrate ammonium.

In connection with waste load allocation, it is often controversial whether the nitrogenous oxygen demand measured in the effluent is exerted in the receiving stream. The basis of this controversy is outlined through the use of historic data from the Passaic River, and a consideration of the nitrogen cycle. The experimentation consisted of following the course of nitrification in Passaic River water samples through the dtermination of nitrogen species, and of enumerations of nitrifying bacteria. Based on the course of nitrification, substrate ammonium appears to have been present in non-growth limiting concentrarion over most of the Passaic main stem. Other nutrients were adequate for nitrification, and there was no evidence of inhibitive effects. These findings lead to an expectation of a nitrifier population expansion with downstream travel, which is not observed. This discrepency is ascribed to the removal of cells from the water column through settling. The results are discussed in relation to the controversy.
W77-08813

PRODUCTION AND HEAVY METAL CONCENTRATION OF VASCULAR AQUATIC MACROPHYTES IN THREE EASTERN CONNECTITUCT RIVERS,
Connecticut Univ., Storrs.
For primary bibliographic entry see Field 5B.
W77-08814

DENSITY AND DISTRIBUTION OF BENTHOS IN LAKE KEOWEE, SOUTH CAROLINA,
Clemson Univ., S.C. Dept. of Zoology.
G. L. Ryals, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 897, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, December 1975. 78 p, 38 fig, 6 tab, 66 ref. OWRT A-027-SC(1).

Descriptors: *Benthos, *Heated water, *Diptera, Water temperature, Dissolved oxygen,

*Distribution, Density, Lakes, *South Carolina, *Invertebrates, Impoundments, Depth, Seasonal.
Identifiers: *Lake Keowee(SC).

Density and distribution of benthic macroinvertebrates were studied from August 1971, to August 1973, in Lake Keowee, a large newly formed impoundment in northwestern South Carolina scheduled to receive discharges of heated water. The effects of depth, station location, and season on density and taxonomic composition of benthos were examined. Total numbers of benthos varied inversely with depth. Abundance was affected by location of sampling sites within the lake, being lower in the discharge canal and proximal areas than in the intake canal and control areas. Station differences were probably related to variations in the particle size distribution and organic content of the substrate. The differences among substrates resulted from preimpoundment construction activities in the discharge area. Total density generally had 3 peaks, in the spring, summer, and autumn. The dipterous families Chironomidae and Chaoboridae were the major taxa. Chironomids were most abundant at 5 m, and chaoborids were most numerous at 20 m. Temperature, dissolved oxygen, and other water quality parameters did not vary significantly among the stations.
W77-08818

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
M. H. Garrell, J. C. Confer, D. Kirschner, and A. W. Fast.
Water Resources Research, Vol. 13, No. 2, p 343-347, April 1977. 3 fig, 4 tab, 11 ref.

Descriptors: *Aeration, *Water pollution control, *Oxygenation, *Lakes, *New York, Eutrophication, Dissolved oxygen, Nutrients, Water treatment, Hypolimnion, Oxygen, Nitrogen, Stratification, Organic loading, Surface waters, Water quality, Limnology.
Identifiers: *Lake Waccabuc(NY), *Lake Oscaleta(NY).

The effects of hypolimnetic aeration on total P, NO3-N, and NH4-N in eutrophic Lake Waccabuc (New York) were described. The lake was aerated for two consecutive summers (1973 and 1974) by using the system described in an earlier paper. Although reductions in hypolimnetic P concentrations appeared in the first summer, the reductions failed to reappear during the second summer. NH4-N and NO3-N concentrations were compared with those in an unaerated control lake. Lake Oscaleta (New York). Very slight changes in relative hypolimnetic NH4-N concentrations and corresponding increases in hypolimnetic N 3-N concentrations were seen. The overall results suggested that the aerated lake is subjected to substantial external loading, which may mask aeration effects on the internal nutrient cycles. (Sims-ISWS)
W77-08824

INLAND WATERS. MONOGRAPHS FROM LIMNOLOGY AND RELATED AREAS, VOL. 26, PART 1. THE ZOOPLANKTON OF INLAND WATERS,
For primary bibliographic entry see Field 2H.
W77-08861

EFFECTS OF TEMPERATURE AND KELTHANE ON GRASS SHRIMP,
California Univ., Davis. Water Science and Engineering Section.
S. Khorram, and A. W. Knight.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, Proceedings paper No 12475, p 1043-1053, October 1976. 2 fig, 6 tab, 25 ref. (Calif. Water Resources Ctr., Project W243).

Descriptors: *Water pollution effects, *Continuous flow, Model studies, *Bioassay, *Insecticides, *Shrimp, Temperature, Aquatic animals, Pollutant identification.
Identifiers: *Organic chlorides, Keloids.

Proportional continuous-flow bioassay tests were used to determine the effects of temperature and Kelthane (organochlorine) on grass shrimp Crangon survival for exposure periods of 24, 48, and 72 hours under laboratory conditions. All specimens were collected from San Pablo Bay, California. Both elevated temperature and Kelthane concentration had a significant inverse effect on Crangon survival, and the responses to an increase in temperature and Kelthane concentration were strongly interdependent. As temperature increased, the Kelthane concentration lethal to a given percentage of shrimp decreased, and, conversely, as Kelthane concentration increased, the temperature lethal to a certain percentage of population decreased. The results are in general agreement with values reported for other aquatic animals. Sublethal effects of Kelthane on Crangon were also observed. Feeding, molting, and motor control were affected by Kelthane. (Bell-Cornell)
W77-08874

EFFECTS OF TREATED MUNICIPAL WASTEWATER AND COMMERCIAL FERTILIZER ON GROWTH, FIBER, ACID-SOLUBLE NUCLEOTIDES, PROTEIN AND AMINO ACID CONTENT IN WHEAT HAY,
Arizona Agricultural Experiment Station, Tucson.
A. D. Day, Abdul Rahman, F. R. H. Katterman, and Varon Jensen.
J Environ Qual. 3(1), 17-19, 1974.

Descriptors: *Water reuse, *Hay, *Crop response, *Wheat, *Irrigation effects, Fertilization, Crop production, Proteins, Amino acids, Irrigation practices, Irrigation water, Nutrients, Water sources, Arizona.
Identifiers: Fiber, Nucleotides, Triticum aestivum, Treated waste water, Nitrogen utilization.

Experiments were conducted at Tucson, Arizona to study effects of treated municipal wastewater on growth, total fiber, acid-soluble nucleotides, total protein and amino acids in hay from wheat (Triticum aestivum L.). Plant heights and number of culms per plant for wheat grown with wastewater were similar to plant heights and number of culms per plant when wheat was produced with well water and suggested amounts of N, P, and K and when it was grown with well water plus N, P, and K in amounts equal to those in wastewater. Wheat plants grown with wastewater had culms with a larger diameter and a higher total fiber content than did plants produced with the other treatments. Highest hay yields were obtained when wheat was grown with wastewater, followed by hay produced with well water plus N, P, and K in amounts present in wastewater, and hay grown with well water plus suggested amounts of N, P and K, in decreasing order. Wheat plants from the 3 irrigation and fertilizer treatments contained similar amounts of acid-soluble nucleotides. Wheat grown with well water plus N, P, and K in amounts equal to those in wastewater and hay produced with wastewater alone contained similar amounts of total protein, and more protein than did hay grown with well water plus suggested amounts of N, P, and K. Wheat utilized the N in wastewater more efficiently than it used the N in well water plus N, P, and K equal to wastewater. The amino acids alanine, glycine, phenylalanine and tyrosine were present in higher concentrations in wheat hay grown with wastewater than in hay produced with the other 2 treatments. Hay grown with the 3 irrigation and fertilizer treatments contained similar amounts of leucine, proline and threonine. When wheat hay was grown with wastewater, none of the observed amino acids were decreased below the levels at which they were present in hay produced with suggested cultural practices. Treated municipal wastewater was an effective source of irrigation water and plant nutrients for the production of high quality hay from wheat in the Southwest.--Copyright 1974, Biological Abstracts, Inc.
W77-08876

A CONCEPTUAL REPRESENTATION OF THE NEW YORK BIGHT ECOSYSTEM,
Water Resources Engineers, Inc., Walnut Creek, Calif.
For primary bibliographic entry see Field 5B.
W77-08900

ANALYSIS OF POLLUTION FROM MARINE ENGINES AND EFFECTS ON THE ENVIRONMENT.
Environmental Control Technology Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5B.
W77-08902

A TRANSIENT, TWO-DIMENSIONAL, DISCRETE-ELEMENT, FAR-FIELD MODEL FOR THERMAL IMPACT ANALYSIS OF POWER PLANT DISCHARGES IN COASTAL AND OFFSHORE REGIONS. PART I: GENERAL DESCRIPTION OF THE MATHEMATICAL MODEL AND RESULTS OF AN APPLICATION,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W77-08905

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
L. S. Slotta, D. A. Bella, D. R. Hancock, J. E. McCauley, and C. K. sollitt.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-240 742, Price codes: A12 in paper copy, A01 in microfiche. Interim Progress Report to the National Science Foundation, December 1974. 262 p, 5 tab, 5 append. GI-34346.

Descriptors: *Estuaries, *Water pollution effects, *Environmental effects, *Baseline studies, *Resources development, Dredging, Monitoring, Toxins, Turbidity, Sediments.

The major research achievements of the NSF-RANN dredging research group at Oregon State University for the first 10 months of its activity is reported. The research focuses on 4 major topics: (1) the effects of dredging on estuarine research can be used effectively by user groups, and (4) the development of concepts and techniques for monitoring impacts of dredging and other alterations to estuaries. The various kinds of impacts discussed in the study include: impacts of dredging and marine traffic; impacts of sediment turnover; impacts of sediment physical changes; impacts of turbidity; and impacts of release of toxins from sediments. (Sinha - OEIS)
W77-08918

EFFECTS OF PRIMARY TREATED AND BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENTS ON THE PRODUCTION, BIOMASS AND GROWTH RATES OF JUVENILE SALMONIDS IN THREE STREAM CHANNELS,
Oregon State University, Corvallis, Dept. of Fisheries and Wildlife.
D. L. Borton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 023,

Price codes: A06 in paper copy, A01 in microfiche. Ph.D. Thesis, June 1975. 87 p, 16 fig, 8 tab, 32 ref, 3 append. OWRT B-029-ORE(1).

Descriptors: *Effluents, *Biomass, Fish, *Salmonids, *Pulp wastes, Biochemical oxygen demand, *Juvenile growth stage, *Growth rates, *Trout, Salmon, Lethal limit, Production, Biological treatment, Waste water treatment.
Identifiers: Production rates.

The effects of sublethal concentrations of primary kraft mill effluent and biologically stabilized kraft mill effluent on the biomass, growth rate, and production of cutthroat trout, Salmo clarki, coho salmon, Onchorhynchus nerka, chinook salmon, Onchorhynchus tschawytscha, and brown trout, Salmo trutta stocked in three experimental channels were studied from 1970 through 1973. These experiments were a part of an investigation of the direct and indirect effects of kraft mill effluents on fish growth and production. Three stream channels, 100 meters long and 2 meters wide with 11 riffles and 11 pools, received 12.7 liters per second each of dilution water pumped from the Willamette River during the entire experimental period. Primary KME from the settling lagoon of an Oregon pulp mill entered one of the streams at a rate of 0.75 mg per liter BOD during experimental periods I and II from January 2, 1970 to March 12, 1971. Biologically stabilized KME from the aeration lagoon of the pulp mill entered stream 2 at 0.75 mg per liter BOD during experimental periods III, IV, V, and VI from March 16, 1971 to January 30, 1973. (See also W71-11659)
W77-08921

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
R. W. Parks.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 995, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, March 18, 1975. 52 p, 12 fig, 93 ref. OWRT A-042-ALA(2).

Descriptors: *Phytoplankton, Dissolved oxygen, Alkalinity, Carbon dioxide, Nitrates, Nitrogen, Solar radiation, Light penetration, Wind velocity, Air temperature, Fish hatcheries, *Cyanophyta, Anabaena, Water pollution effects.
Identifiers: Soluble inorganic phosphorus, Die-offs, *Anabaena circinalis, *Microcystis aeruginosa.

Physical and chemical parameters associated with phytoplankton abundance and periodicity were studied in a pond (S-3) at the Auburn University Fisheries Research Unit, Auburn, Alabama, from February 1, 1974 to September 6, 1974. Data involving water temperatures, dissolved oxygen, pH, alkalinity, free carbon dioxide, soluble inorganic phosphorus, nitrate-nitrogen, ammonia-nitrogen, incident solar radiation, light penetration, air temperatures, and wind velocity were recorded. Attempts were made to find correlations between the information obtained from the data and the periodicity and abundance of phytoplankton in S-3. Two species of blue-green algae, Anabaena circinalis (Kutz.) Rab. and Microcystis aeruginosa Kutz. were studied in particular. These two species dominated the phytoplankton population at different times of the year. Several die-offs of these species occurred in which only a portion of their populations died. Factors responsible for these partial die-offs were hypothesized. Chemical factors had little effect on these die-offs, instead the die-offs had a noticeable effect on the chemical parameters. Physical factors were thought to set conditions which eventually lead to the die-offs. It was hypothesized that the lack of wind action allowed surface scums of Anabaena circinalis and Microcystis aeruginosa to form. Other physical factors such as light and temperature then contributed to the death of the algal cells near the surface.
W77-08922

BENTHIC MACROINVERTEBRATES AS INDEXES OF WATER QUALITY IN THE SCIOTO RIVER BASIN, OHIO,
Akron University, Akron, Ohio, Department of Biology.
For primary bibliographic entry see Field 5A.
W77-08925

MINIMUM OXYGEN LEVELS SURVIVED BY STREAM INVERTEBRATES,
Virginia Commission of Game and Inland Fisheries, (Richmond).
E. W. Surber, and W. E. Bessey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 012, Price codes: A04 in paper copy, A01 in microfiche. Virginia Water Resources Research Center, Blacksburg, Bulletin 81, December 1974, (VPI-WRRC-BULL 81). 52 p, 15 fig, 5 tab, 4 ref.

Descriptors: *Invertebrates, Oxygen, *Dissolved oxygen, *Mortality, Water pollution effects, *Ohio, *Bioassay, *Benthic fauna, Mayflies, Stoneflies, *Aquatic insects, Dragonflies, Amphipoda, *Crustaceans, Clams, Snails, Isopods, Crayfish, Caddisflies, Larvae, *Lethal limit.
Identifiers: Damselflies, Alderflies, Water penny, Hellgrammites, Craneflies, Horseflies, Whirligig beetles, *Oxygen level fluctuations.

The objective was to explore, experimentally, the lowest levels of dissolved oxygen that could be tolerated by some of the common invertebrate animals of streams in the Cincinnati area. Most of the bottom animals used in the experiments were collected from riffles of the Little Miami River above Milford, Ohio; the East Fork of the Little Miami above Batavia; the Mad River above Urbana, Ohio; and Mt. Carmel Creek near Mt. Carmel, Ohio. The experiments were carried out in a constant temperature bioassay room of EPA's Robert A. Taft sanitary Engineering Center, Cincinnati, Ohio. Results of all experiments are summarized; specimens used in the experiments, elapsed time of each experiment, the experimental dissolved oxygen, and mortality data are presented. The following species or specimens were investigated: Sphaerium striatinum; Goniobasis livescens; Lirceus fontinalis; Crangonyx setodactylus; Gammarus fasciatus; Cambarus ortmanni; Orconectes rusticus; Stenonema tripunctatum; Stenonema heterotarsale; Stenonema ares; Stenonema vicarium; Stenonema femoratum; Heptagenia maculipennis; Heptagenia flavescens; Leptohlebia; Isonychia bicolor; Ephoron leukon; Hexagenia limbata; Acroneuria lycorias; Neoperla clymene; Phasganophora capitata; Psephenus herrick: Corydalus cornutus; Sialis; Agrion maculatum; Argia moesta; Boyeria vinosa; Anax junius; Plathemis lydia; Hdropsyche slossonae; Tipula abdominalis; Tabanus; Hyalella azteca; and Dineutes.
W77-08926

INDUCED VERTICAL MIXING IN A STRATIFIED IMPOUNDMENT BY A SUBSURFACE WARM WATER DISCHARGE,
Wisconsin University, Madison. Department of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5B.
W77-08929

A PREDICTIVE PHOSPHORUS MODEL FOR LAKES - DEVELOPMENT AND TESTING,
North Carolina University, Chapel Hill, Department of Environmental Sciences and Engineering.
W. J. Snodgrass.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 985, Price codes: A15 in paper copy, A01 in microfiche. PhD Thesis, 1974. 309 p, 61 fig, 27 tab, 127 ref, 5 append. OWRT A-074-NC(1).

Descriptors: Phosphorus, Eutrophication, Lakes, *Mathematical models, Cycling nutrients, *Input-output analysis, Seasonal, Water pollution effects, Water pollution sources, Nutrients, *Model studies.
Identifiers: *Phosphorus concentration models. Hydraulic loading.

The main goal was to develop a mathematical input-output model capable of predicting the phosphorus concentration in a lake as a function of mean depth, hydraulic loading, and nutrient loading to the lake. The developed model shows excellent agreement between observed and predicted phosphorus concentrations for lakes with a wide range of mean depths (14-300 m) and hydraulic detention times (1 to 700 yr.). For lakes with oxic hypolimnia, the model is verified to make predictions concerning (1) the P concentration in a lake resulting from a given rate of input of P and (2) the extent of lake improvement which can result from a given reduction in the land-based nutrient loading. Model predictions of the P retention factor are made for hydraulic loadings and mean depths characteristic of a wide range of lakes, and are described by nomographs. Sensitivity analyses indicate that the model is most sensitive, in decreasing order of sensitivity, to the input rate of P, the settling coefficient, and the decomposition coefficient. The model is fairly sensitive to vertical exchange across the thermocline, but quite insensitive to the epilimnetic production coefficient and the epilimnetic depth. Model predictions of temporal trends are compared with observed monthly values for Lake Ontario and Sempachersee and with recovery of Lake Washington after removal of sewage inputs. Model predictions of mass flows between P compartments and the time to reach stable-state are analyzed. Sufficient data for verifying these model predictions are not available. (See also W76-03243) (Stewart-NC State)
W77-08930

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 6G.
W77-08936

KINETIC RESPONSE OF PERTURBED MARINE NITRIFICATION SYSTEMS,
Delaware Univ., Newark. Coll. of Marine Studies.
R. F. Srna, and A. Baggaley.
Available from the National Technical Information Service, Springfield, VA 22161 as COM-75-11079, Price codes: A02 in paper copy, A01 in microfiche. Report DEL-SG-13-75, June 1975, Reprint from Journal of the Water Pollution Control Federation, vol. 147, no. 3, March, 1975, p. 472-486, 1 tab, 7 fig, 25 ref.

Descriptors: *Marine bacteria, Marine microorganisms, Microbiology, *Nitrites, *Nitrogen compounds, *Nitrogen cycle, Nitrogen fixation, *Ammonia, Ammonium compounds, *Ammonium salts, Hydrogen ion concentration, Analytical methods, Kinetics, Water pollution effects.
Identifiers: *Ammonium chloride, *Nitrifying bacteria, First-order rate equations, Michaelis-Menten kinetics.

Large, stable, reproducible populations of nitrifying bacteria may be defined and maintained by a daily ammonium chloride input to a bacterial culture. The rate of conversion of ammonium ion and

nitrite ion by large populations of nitrifying bacteria may be described accurately by first-order rate equations. The first-order rate equations may be combined to provide more general equations that include consideration of the consecutive nature of the nitrification process. Michaelis-Menten kinetics may be used to explain the decrease in the first-order rate constant at high initial concentrations of ammonium or nitrite ions. The temperature, pH, and sulfide ion concentrations significantly affect the rate of nitrification, while small changes in salinity, (5 to 8 ppt) do not. (Katz)
W77-08946

TOXICITY OF FOUR PESTICIDES TO WATER FLEAS AND FATHEAD MINNOWS,
EG and G, Bionomics, Wareham, Mass.
K. A. Macek, M. A. Lindberg, S. Sauter, K. S. Buxton, and P. A. Costa.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-262 912, Price codes: A04 in paper copy A01 in microfiche. Environmental Protection Agency, Ecological Research Series, Report EPA 600/3-76-099, November 1976. 57 p, 29 tab, 49 ref.

Descriptors: *Pesticides, *Toxicity, Bioassay, Freshwater fish, Crustaceans, Daphnia, *Zooplankton, *Heptachlor, Methodology, Mortality, Fish reproduction, Aquatic animals, Aquatic populations, Water pollution effects, Pollutant identification.
Identifiers: *Acrolein, *Endosulfan, *Trifluralin, Acute toxicity, Chronic toxicity, Maximum acceptable toxicity concentrations, *Fathead minnows, Pimephales, *Water fleas.

Maximum acceptable toxicant concentration (MATC's) for each pesticide for both species were estimated by measuring survival, growth and reproduction success as indicators of toxic effects. The MATC for acrolein was estimated to be >16.9 and <33.6 microgram/l for daphnids and >11.4 and <41.7 for fathead minnows, those estimated for heptachlor were >12.5 and <25.0 microgram/l for daphnids and >0.86 and <1.84 microgram/l for fathead minnows, those estimated for endosulfan were >2.7 and <7.0 microgram/l for daphnids and >0.2 and <0.4 microgram/l for fathead minnows, and those estimated for trifluralin were >2.4 and <7.2 microgram/l for daphnids and >1.9 and <5.1 microgram/l for fathead minnows. (Katz)
W77-08948

QUALITATIVE AND QUANTITATIVE CHANGES IN THE BENTHIC FAUNA OF A TROUT STREAM, THE COUZE PAVIN PUY-DE-DOME, CAUSED BY AGRICULTURAL AND URBAN POLLUTION, (IN FRENCH),
Institut National de la Recherche Agronomique, Paris (France).
M. Echaubard, and A. Neveu.
Ann Stn Biol Besse-En-Chandesse 9, p 1-24. 1974/1975.

Descriptors: *Benthic Fauna, *Agricultural runoff, *Urban runoff, *Tubificids, *Streams, Effluents, Diptera, Water pollution sources, Stoneflies, Sewage effluents, Environmental effects, Biomass, Mayflies, Water pollution effects.
Identifiers: Coleoptera, Couze Pavin, *France, Puy-De-Dome, Trichoptera.

The upper reaches of the stream are relatively unpolluted while the lower reaches receive the effluent from a cheese factory and sewage from the town of Besse (France). The benthic fauna was studied over a 3 yr period at a number of stations both above and below the sources of pollution. Tubificids and Chironomids show great abundance below the sources of pollution. Plecoptera are abundant only above the pollution. The total biomass of benthos in the stream is at a maximum just below the region where the sewage enters the river. The diversity of the population is at a minimum in this area also increasing both upstream and downstream. Downstream (n10km) of the sources of pollution the benthic fauna is almost. (Trichoptera, Coleoptera and Ephemeroptera are mentioned.)--Copyright 1977, Biological Abstracts, Inc.
W77-08955

CHIRONOMID FAUNA OF THE UPPER COURSE OF THE ISETI RIVER, (IN RUSSIAN),
Sverdlovskii Selskokhozyaistvennyi Institut (USSR).
G. A. Sokolova.
Gidrobiol Zh. 10(2), p 73-76, 1974.

Descriptors: *Diptera, Rivers, Self purification, Water pollution.
Identifiers: *Orthocladiinae, *Pelopiinae, *USSR(Iselti River).

An investigation of a 175-km stretch of the Iseti River from the source to the city of Kamensk-Ural'skii (Sverdlovsk district, USSR) revealed 51 forms of larva Chironomidae belonging to the subfamilies Chironominae (27 forms), Orthocladiinae (20 forms) and Pelopiinae (4 forms). The chironomid fauna was impoverished at places where waste waters entered the river. With self-purification of the river and its dilution by tributary waters, the species diversity of chironomids increased.--Copyright 1975, Biological Abstracts, Inc.
W77-09048

ENVIRONMENTAL LIMITATIONS ON THE MICROBIAL DEGRADATION OF HYDROCARBONS IN TEMPERATE LAKES,
Wisconsin Univ.-Madison. Dept. of Bacteriology.
D. M. Ward.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 193, Price codes: A09 in paper copy, A01 in microfiche. Ph.D. Thesis, 1975. 136 p, 5 tab, 14 fig, 70 ref. OWRT A-054-WIS(1), 14-31-0001-3850, 14-31-0001-5050.

Descriptors: *Microbial degradation, Environmental effects, *Oil pollution, *Nitrogen, *Phosphorus, *Wisconsin, Lakes, Organic compounds, Water pollution effects, Bacteria, Biodegradation, *Nutrients.

Nutritionally versatile heterotrophic bacteria inhabit lakes and develop in response to hydrocarbon introduction. However, the response of naturally-occurring oil-degrading microorganisms depends on environmental conditions within a lake. The rate of hydrocarbon biodegradation varied seasonally in Lake Mendota because of temperature limitation in spring and fall and nutrient limitation in mid-summer, and was optimal for only one month during the year. Nutrient limitation was also observed in lakes of varying nutrient content in Vilas County. Relationships between hydrocarbon oxidation rates and temperature or nutrient levels were shown by correlation and experimentally, and optimum conditions were established. Hexadecane oxidation was inhibited in lake water and sediment samples incubated anaerobically. The lack of oxygen also inhibited hexadecane oxidation in the presence of nitrate, a thermodynamically favorable electron acceptor. Acetate and glucose were also found to inhibit hexadecane oxidation in lake water samples. Acetate inhibition was indirectly caused by depletion of nitroglen and phosphorus by acetate-oxidizing bacteria. Glucose inhibition occurred in the presence of excess nitrogen and phosphorus and may result from regulatory interference such as catabolite repression. The presence of oil-degrading bacteria does not ensure rapid removal of oil pollutants in temperate lakes where environmental conditions usually limit hydrocarbon biodegradation. (See also W75-10407)
W77-09059

ENVIRONMENTAL REGULATION OF GAMETOGENESIS IN SCENEDESMUS OBLIQUUS,
Connecticut Univ., Storrs.
J. R. Cain.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 146, Price codes: A05 in paper copy, A01 in microfiche. Ph.D. Dissertation, 1975. 60 p, 5 tab, 9 fig, 48 ref, 2 append. OWRT A-052-CONN(5), 14-31-0001-3507.

Descriptors: *Environmental control, *Algae, *Cultures, *Nutrients, *Nitrogen, *Light, *Temperature, *Water pollution effects, Incubation.
Identifiers: *Gametogenesis, *Scenedesmus obliquus, Laboratory media, Salt concentrations.

The roles of nutrients, light and temperature in regulating Scenedesmus obliquus gametogenesis have been studied in culture. Gametogenesis is inhibited by the presence of nitrogen, but not by the presence of other medium components, at the concentrations found in a routine algal culture medium. Data indicate, however, that gametogenesis is not a response to nitrogen depletion or starvation. Nitrogen concentration in the medium determines the number of cells in the culture which will form gametes, but does not affect the rate of gamete production or time of onset of gametogenesis. Temperatures 30C or higher not only inhibit gamete formation, but are detrimental to survival of gametes formed at lower temperatures. A minimum of 20-24 hours exposure to favorable nitrogen levels and 15C temperature is required before any cells in the culture reach a point of no return for gamete formation. Light stimulates gametogenesis, but is not an absolute requirement, as a small but significant number of cells are capable of producing gametes in the absence of light, under nitrogen concentrations favorable to gametogenesis. The stimulatory effect of light depends upon exposure both early and late in the incubation period for gamete induction. Cultures maintained in the laboratory lose their capacity for gamete formation; evidence indicates that unnaturally high salt concentrations in laboratory media are involved. (See also W77-05314) (de Lara-Conn)
W77-09060

MAN'S EFFECT ON THE FISHES OF THE UPPER SHETUCKET RIVER SYSTEM,
Connecticut Univ., Storrs.
R. M. Goldstein.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 094, Price codes: A03 in paper copy, A01 in microfiche. Ph.D. dissertation, 1975. 43 p, 14 tab, 6 fig, 64 ref. OWRT A-052-CONN(8), 14-31-0001-3507.

Descriptors: *Fish populations, *Physiological ecology, *Fish management, Water pollution effects, *Sewage effluents, *Water level fluctuations, *Urbanization, *Silting, Impoundments, Dams, *Connecticut.
Identifiers: *Fish species composition, *Human influence index, Seining, Snorkeling, *Upper Shetucket River system(Conn).

Man's effect on the fishes of the upper Shetucket River System and the effect of the city of Willimantic on fishes were determined by (1) comparing changes in species composition in the four major rivers on the upper Shetucket River system, above and below the city of Willimantic, and growth of fishes above and below the city, with expected trends or values; (2) evaluating historical information on the building of dams, growth of industry and human population, and a present 'human influence index' with relative abundance of selected species; and (3) comparing species composition and a 'human influence index' in the Shetucket River with trends developed from 15 rivers in southern New England. The fishes of all four rivers of the upper Shetucket River system were affected to some degree by man; and the city of Willimantic did affect fish populations

downstream. The effects of fluctuating water levels from power generation at Scotland Impoundment are discussed. This factor may have had greater effects on fish populations below the city of Willimantic in the Shetucket River than any of man's other actions. (de Lara-Conn)
W77-09061

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W77-09062

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
For primary bibliographic entry see Field 5G.
W77-09080

WILLIMANTIC RIVER ORGANISMS GROWN IN MEDIA WITH NATURAL SUBSTRATE LEVELS AS INOCULA FOR ALGAL ASSAYS,
Connecticut Univ., Storrs, Inst. of Water Resources.
F. R. Trainor.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 192, Price codes: A01 in paper copy, A01 in microfiche. Completion Report, 1977. 18 p, 13 fig, 1 tab, 1 ref. OWRT A-061-CONN(1). 14-31-0001-6007.

Descriptors: *Algae, Assay, *Carrying capacity, *Nutrients, *Sewage effluents, *Growth rates, *Nitrogen, *Phosphorus, Chlorella, *Connecticut, *Bioassay, Water pollution effects, Pollutant identification.
Identifiers: *Growth media evaluation, *Natural substrate levels, *Nutrient carryover, *Maintenance media, *National test organism, Ankistrodesmus, Selenastrum, *Willimantic River(Conn), *Algal growth.

Field and laboratory studies were utilized in the evaluation of the Willimantic River as a growth medium for Selenastrum, Chlorella, and Ankistrodesmus. The algae were grown in low nutrient water collected above and below the University of Connecticut sewage effluent as well as in the nutrient rich effluent itself. The growth of all three algae (as measured in doublings per day) increased in the effluent medium. Phosphorus, measured as orthophosphate, was the limiting nutrient. The order of algal growth in the nutrient poor water was Chlorella, Selenastrum, and Ankistrodesmus (PO4 = .07-.47 mg.l-1). When nutrient rivch water was used, the order of growth was Chlorella, Ankistrodesmus, and Selenastrum (PO4 = 1.0-5.0 mg.l-1). At extremely high phosphorus (PO4 greater than 5.0 mg.l-1) Ankistrodesmus became the most actively growing alga followed by Chlorella and Selenastrum. Nitrogen effects seem to be secondary. The primary usable nitrogen source in this system was NO3. NH4 has little effect on algal growth at natural levels and becomes toxic at high concentrations. N/P ratios did not adequately define the carrying capacity of this system. Medium 3.6 was evaluated in terms of its suitability as a maintenance medium for the three algae. Lowered nitrogen or phosphorus resulted in Selenastrum death and inconsistent Chlorella and Ankistrodesmus growth. Increased nitrogen or phosphorus resulted in carry-over on all cases. (de Lara-Conn)
W77-09091

EFFECTS OF PRIMARY SEWAGE EFFLUENT FROM THE CITY OF WILLIMANTIC ON THE BENTHIC INVERTEBRATE FAUNA OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
R. P. Klattenberg.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 187, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1974. 68 p, 10 fig, 12 tab, 47 ref, append. OWRT A-052-CONN(4), 14-31-0001-3507.

Descriptors: Water pollution effects, *Sewage effluents, *Silting, *Benthic fauna, *Invertebrates, *Aquatic fungi, Physicochemical properties, Carrying capacity, Organic loading, Sewage treatment, *Connecticut, Artificial substrates, Sampling, Monitoring, Pollutant identification.
Identifiers: Hester-Dendy samplr, *Willimantic/Shetucket Rivers(Conn).

A year-long water quality sampling program was conducted to evaluate what effects sewage discharge by the Willimantic Sewage Treatment Plant had on the physicochemical characteristics and benthic macroinvertebrates of the Shetucket River, Connecticut. Benthic macroinvertebrates were collected above and below the sewage discharge at sixteen sampling stations using Hester-Dendy artificial substrate samplers. Water quality analysis and the presence of Tricoptera larva indicated the Willimantic/Shetucket Rivers to be affected only marginally by organic loading and temporary heavy siltation, resulting from construction activities at the new treatment plant site. Nutrient enrichment resulted in an abundance of 'sewage fungus' below the sewage treatment plant. A larger population of three taxa of benthic macrofauna (Tendipedidae as a group and two genera of Hydropsychidae) below the sewage treatment plant was attributed to increased carrying capacity associated with the sewage fungus organic matter which the benthic macrofauna could utilize as food. Sampler selectivity seemed to be reflected in the limited benthic fauna collected along the study reach as well as in the high positive relationship between increases in silt collecting on samplers and standing crop biomass. Color illustrations reproduced in black and white. (de Lara-Conn)
W77-09093

THE EFFECT OF THE WILLIMANTIC SEWAGE TREATMENT PLANT ON THE MICROFLORA AND METABOLISM OF THE SHETUCKET RIVER,
Connecticut Univ., Storrs.
E. A. Matson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 183, Price codes: A05 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 78 p, 14 fig, 14 tab, 98 ref. OWRT A-052-CONN(6), 14-31-0001-3507.

Descriptors: *Aquatic microorganisms, Sewage effluents, Water pollution effects, *Chlorination, *Productivity, River flow, *Coliforms, Aquatic bacteria, Yeasts, *Connecticut, Bioindicators, *Streptococcus.
Identifiers: *Indicator microbial populations, *Dissolved organic carbon, Net community production, *Shetucket River(Conn).

This study was initiated to determine the effects of the effluent of the Willimantic, Connecticut Sewage Treatment Plant (STP), which accounts for an annual average of 1% of river volume, on the indicator microbial populations, dissolved organic carbon (DOC), productivity and metabolism of the Shetucket River. Total fecal coliforms, fecal streptococci, 'plate count' bacteria and yeasts capable of growth at 20 and 37 C were monitored biweekly for 16 months. DOC was measured seasonally and diurnally for one year using the thermal combustion technique. Net community production was measured using the upstream-downstream technique and respiratory estimates were made for fish and invertebrates. The results indicate that during nonchlorination periods, populations of indicator microflora downstream of the treatment plant are substantially higher than those upstream, and are also modified by dilution of the effluent due to seasonal trends in river volume. During chlorination periods downstream populations are generally equal to or less than those upstream. The sewage treatment plant does not significantly affect productivity or metabolism of this otherwise eutrophic river. However, during low river flow in summer, the increased DOC load due to the treatment plant can reduce net community production by half. (de Lara-Conn)
W77-09094

THE EFFECT OF SECONDARILY TREATED SEWAGE ON THE ALGAL POPULATIONS OF THE WILLIMANTIC/SHETUCKET RIVERS,
Connecticut Univ., Storrs.
R. L. Klotz.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 172, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 46 p, 10 fig, 1 tab, 77 ref. OWRT A-052-CONN(7), 14-31-0001-3507.

Descriptors: *Algae, *Competition, Sewage treatment, Rivers, Water pollution effects, Bioassay, Pollutant identification, *Connecticut, Sewage effluents, Monitoring.
Identifiers: *Two-membered algal assay, *Attached algae, *Competitive balance, *Sewage treatment effluent, Achnanthes deflexa, Unicellular algae, *Willimantic/Shetucket Rivers(Conn).

Field and laboratory procedures have proven that the secondarily treated effluent from the Willimantic, Connecticut sewage treatment plant influences the composition of the attached algal flora in the Shetucket River. This effect is due to the effluents altering the competitive balance between the two algal species. A unicellular alga completely dominates highly polluted stretches of the river, while Achnanthes deflexa shares dominance with this organism in other areas. The degree of river pollution can be estimated by enumerating the natural standing crops of these two algae. A two-membered assay utilizing these organisms is a sensitive laboratory pollution monitor and a useful predictive tool. (de Lara-Conn)
W77-09096

THE EFFECTS OF WASTEWATER IRRIGATION ON THE ACTIVITIES AND MOVEMENTS OF SONGBIRDS,
The Pennsylvania State Univ., University Park. School of Forest Resources.
J. R. Snider.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 185, Price codes: A03 in paper copy, A01 in microfiche. Master of Science Thesis, March 1974. 41 p, 10 tab, 6 fig, 25 ref, append. OWRT B-059-PA(2), 14-31-0001-3932.

Descriptors: *Song birds, *Return flow, Marking techniques, Nesting irrigation, Waste water disposal.
Identifiers: *Wastewater irrigation, *Mixed-oak forest, Songbird activity, *Shrub cover, *Irrigated sites, Unit of netting time, Aspen-white pine-shrub area, Cat bird, Yellow throat, Song sparrow, Ovenbird, Scarlet tanager, Indigo bunting.

Songbird responses to the irrigation of wastewater appeared to be closely correlated with habitat alterations and changes in food sources and avilability. The mixed-oak area had a higher capture rate on the non irrigated site during the first half of each of the two summers with a change in songbird activity occurring in mid-July. During the second half of the summer in both 1972 and 1973, significantly more birds per unit of netting time were caught on the irrigated site of the mixed-oak forest and this increase in activity appeared to be related

to an increased food supply. On non-irrigation days in the aspen-white pine-shrub area, a significantly higher repeat capture rate was recorded for the irrigated site and was primarily due to the number of captures of catbirds, yellow throats and song sparrows. The difference in recapture rate for the three summer residents is an apparent response to the increased amount of shrub cover on the irrigated site. A reduction in songbird use of the irrigated site. A reduction in songbird use of the irrigated site of the aspen-white pin-shrub area was observed on irrigation days when captures of new birds per unit of netting time were significantly higher in the non-irrigated site in 1973. (Sink - Penn State).
W77-09098

DEER HABITAT RESPONSE TO IRRIGATION WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. Dept. of Biology.
R. L. Dressler.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 166, Price codes: A03 in paper copy, A01 in microfiche. Master of Science Thesis, June 1973. 29 pp, 8 tab, 19 ref, append. OWRT B-059-PA(1), 14-31-0001-3932.

Descriptors: *Deer, *Irrigation water, *Wildlife, *Sewage effluents, *Irrigation effects, *Waste water disposal, Forages.
Identifiers: *Wastewater irrigation, *Deer habitat, Mixed-oak stands, Forage production, Pokeweed, Deer use, Snow track, Bed count.

Three main points were established concerning the effects of wastewater irrigation on deer and deer habitat in mixed-oak stands. About the same amounts of forage appeared to be available during the winter and early spring months on the irrigated site as compared to the non-irrigated site. Second, total forage production in the summer period was greatly increased by irrigation. However, the bulk of the total forage production was in one species, pokeweed, which was a monor component in the deer's diet in this plant community. Similarly the nutrient content was reduced because most of the nutrients were tied up in the pokeweed. Third, these changes had no adverse effects in terms of deterring deer use of the irrigated site. Semi-free ranging lead deer used the irrigated site for feeding about four times as much as the non-irrigated site. Based on the evidence of snow track and bed count data no indication was found of reluctance by wild deer to use the irrigated site. (Sink - Penn State)
W77-09099

5D. Waste Treatment Processes

HIGH SPEED LIQUID CHROMATOGRAPHIC ANALYSIS OF COBALAMIN PRODUCTIVITY AND DISTRIBUTION IN ACTIVATED SEWAGE SLUDGE TREATMENT,
Clark Univ., Worcester, Mass.
For primary bibliographic entry see Field 5A.
W77-08621

NITRIFICATION AND HEAVY METAL REMOVAL IN THE ACTIVATED SLUDGE TREATMENT PROCESS,
Texas A and M Univ., College Station.
P. A. Richards.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-2662. PhD Thesis, 1976. 182 p.

Descriptors: *Nitrification, *Heavy metals, *Activated sludge, *Separation, Sludge treatment, Analysis, Sewage treatment, Dissolved oxygen, Temperature, Suspended solids, Chemical oxygen demand, Nitrogen, Hydrogen ion concentration, Alkalinity, Waste water treatment.

The relationship between nitrification and heavy metal removal was investigated in the activated sludge treatment process. Chromium was studied at 0.1-10.0 milligrams/liter, and silver was studied at 0.1-0.5 milligrams/liter in settled primary domestic sewage. The analyses covered heavy metal concentration, pH, dissolved oxygen, temperature, suspended solids, chemical oxygen demand, nitrogen species, and alkalinity. There were indications that sludge wasting rates are directly related to heavy metal removal. Nitrification indirectly affects the process because sludge wasting controls sludge age, which controls nitrification. A theory on the mechanisms of heavy metal removal was developed; sludge wasting was considered the key mechanism of this process. (Collins-FIRL)
W77-08623

PREDICTION OF NITROGEN TRANSFORMATIONS IN THE STORAGE LAGOON OF A LAND TREATMENT SYSTEM,
Massachusetts Univ., Amherst.
Y-S. Su.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-6425. PhD Thesis, 1976. 178 p.

Descriptors: *Storage, *Lagoons, Biological treatment, Algae, Bacteria, Nitrogen, Model studies, Nitrification, Ammonification, Pilot plant, Sewage effluents, Irrigation, Waste water treatment.
Identifiers: Land treatment system.

The influence of storage lagoons on the nitrogen balance in a land treatment system was studied. The lagoon functions as a biological reactor where algae and bacteria transform input nitrogen. A simulation model was developed to predict yearly concentrations of ammonium, nitrate, organic nitrogen and algae in the lagoon. Ammonification, nitrification, and algal uptake were considered, as were the effects of temperature, solar radiation, and rate-limiting nutrients. Data were taken from a storage lagoon with a three-month winter storage followed by a nine-month empty period. There was a great reduction of obtainable inorganic nitrogen during a substantial portion of the irrigation period; algal uptake of nitrogen was indicated as the most important factor in the lagoon's dynamic behavior. Algal growth and death rate constants had the greatest effect on ammonium-N and nitrate-N-profiles. Nitrification and ammonification were much less important. Reductions in the required irrigation land area resulted from the decrease in nitrate due to storage lagoon transformations. Lagoon effluent should be blended with secondary effluent in varying ratios during the growing season in order to design a system with a nitrogen supply equal to crop demand. (Collins-FIRL)
W77-08624

REMOVAL OF FLUORINE FROM WASTE WATERS. III. FUNDAMENTAL TESTS WITH CHEMICAL REAGENTS (HAISUICHU NO FUSSO JOKYO NIKANSURU KENKYU. III. SHIYAKU KEI NIYORU KISOSHIKEN),
M. Mori, Y. Iwasaki, Y. Utsumi, H. Miura, and J. Ando.
Senkko to Skkai, (Gypsum and Lime), No. 146, p 9-14, 1977. 2 ref.

Descriptors: *Fluorine, *Separation techniques, *Calcium compounds, *Waste water treatment, Pollution abatement, Lime, Magnesium, Coagulation, Chemical reactions, Analysis.

Various chemical reagents were tested in an investigation of fluorine removal from waste water. Lime added to a dilute hydrogen fluoride solution produced minute calcium fluoride particles; a portion of these tended to pass through a filter. Magnesium was found to reduce crystal size, make precipitate gelatinous, and aid separation and coagulation. It did not reduce fluorine below 15 ppm since magnesium fluoride is more soluble than calcium fluoride. The length of time needed to reduce the supersaturation of calcium fluoride was the major obstacle in reducing fluorine to meet water quality standards. The addition of lime raises the pH and causes fluorine removal to be difficult in waters with a high concentration of alkaline substances. Reduction of fluorine was aided by the addition of an acid or soluble calcium compound. (Collins-FIRL)
W77-08626

WHAT'S UP WITH OXYGEN/2,
Brown and Caldwell, Walnut Creek, Calif.
B. D. Bracken.
Water and Wastes Engineering, Vol. 14, No. 4, p 48-49, 52-56, April, 1977. 3 fig, 2 tab.

Descriptors: *Oxygen, *Treatment facilities, Design criteria, Construction, Equipment, Water purification, Cooling water, Heat balance, Personnel, Instrumentation, *Waste water treatment, Electric power demand, Heat exchangers.
Identifiers: *Liquid oxygen.

Design factors are discussed in the second of two articles on cryogenic oxygen plants. Heat exchange is a part of the oxygen production process. A cryogenic expansion turbine produces refrigeration for air separation and liquid production. Plants with a capacity of 180 tons/day or more generate enough work to justify the equipment necessary to recover the work as electrical power. About 75 kw can be obtained from a plant of this size operating at maximum design production. Liquid oxygen is stored near the cryogenic oxygen plant in horizontal or vertical tanks. These are double-walled and designed to reduce oxygen losses to 0.3-0.4% per day of contained oxygen by weight. Oxygen vaporizers are used to convert stored liquid oxygen to vapor for a supplemental or substitute oxygen source to supply the dissolution system. Vaporization of one ton of liquid oxygen stored at just under the boiling point will require 92 Btu/pound or 184,000 Btu/ton. Liquid oxygen vaporization can be conducted with a water-to-oxygen heat exchanger. This heat exchanger. This heat exchanger can provide the continuous heat so that vaporization may be instituted at any time necessary. Considerations for a cryogenic oxygen plant for municipal waste water treatment include plant size, electrical requirement, cooling water needs, effluent heat load, noise levels, instrument or dry, filtered, oil-free air requirements, staff requirement, site requirements, and instrumentation and control equipment. (Collins-FIRL)
W77-08627

SLUDGE DISPOSAL IN THE NORTH WEST,
For primary bibliographic entry see Field 5E.
W77-08628

FINE SCREENING OF RAW SEWAGE,
For primary bibliographic entry see Field 8G.
W77-08629

WASTE WATER AERATION SYSTEM PRODUCES SMALL BUBBLES.
Chemical Engineering, Vol 84, No 9, p 81-82, April, 1977.

Descriptors: *Aeration, Equipment, *Performance, *Evaluation, Operating costs, Capital costs, Oxidation lagoons, Chlorination, Treatment facilities, Municipal wastes, *Waste water treatment.

The Aerocleve submerged secondary treatment aeration system is described by Clevepak Corp., Fall River, Massachusetts. It was promoted as being 150% as effective as mechanical surface aerators. A bubble diameter of 0.2-0.4 millimeters is produced as compared to 1-2 millimeters from

diffused-air systems and 2-2 1/2 millimeters from mechanical surface devices. Air and recirculated waste water are concurrently passed at different velocities through the mixing chamber, creating air pockets. A vortex and fine air bubble mist are formed from exerting a compressive force on the air pockets. The bubble stream discharges as a high-velocity, turbulent horizontal plume. Increased dwell time is the result; this, combined with the small bubble diameter, produces an efficient use of energy. Operating costs are 50% that of diffused-air systems and 75% that of surface aeration. Capital costs are 30% less than diffused air and 20% less than surface aeration. Clogging is avoided in this system by eliminating porous plates and perforated sparges; the smallest passage is 1 1/4 inches in diameter. There are no moving parts in the manifolds or mixing chambers. Submerged parts are constructed of polyvinyl chloride or stainless steel. The system can be used for deep-tank applications, activated sludge aeration basins, and extended aeration lagoons. It is useful in upgrading conventional diffused-air systems and is especially useful in freezing climates. It can also be used in package treatment plants, and in chemical mass transfer and chlorination processes. Field tests showed a 50% reduction in power costs in municipal applications. (Collins-FIRL)
W77-08630

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
For primary bibliographic entry see Field 5G.
W77-08631

NEW PLYMOUTH SEWERAGE SCHEME,
J. R. Fitzmaurice.
New Zealand Engineering, Vol 32, No 2, p 26-30, February, 1977. 4 fig, 6 ref.

Descriptors: *Sewers, Drainage, *Outfalls, *Waste water treatment, Waste disposal, Bacteria, Sewage effluents, *Treatment facilities, Environmental effects, *Water pollution control, Construction, COsts, Waste disposal.
Identifiers: New Plymouth(New Zealand).

Treatment schemes were devised for New Plymouth, New Zealand, after a survey to determine the inadequacies of its sewerage system. The studies indicated that outfalls would be very expensive and few locations were adequate for them. Surface movement of water near the shoreline and strong winds would not regularly assist diluted waste discharge movement in either direction along the coast. There are no present water quality standards for receiving waters, but any treatment system should be adaptable for easy and economical improvements if standards are later required. Several alternative plans were considered involving outfalls at various locations, varying treatment levels, disposal to oxidation ponds, and drainage systems. Environmental impact studies were also conducted. The treatment plant proposed for the area will be a primary treatment facility with provisions for adding secondary treatment and chlorination. The level of treatment will depend on water quality standards to be developed and may alter with time. Processes included will be screening, grit removal, sedimentation, and sludge digestion. Power will be derived from process methane and the on-site generation of electricity. Capital costs are expected to be about $8,230,000, with annual costs of about $965,000. (Collins-FIRL)
W77-08632

PRETREATMENT HELPS NIAGARA CUT COSTS,
Niagara Falls Sewage Dept., New York.
J. Sirianni, and E. C. Richardson.
Water and Wastes Engineering, Vol 13, No 11, p 44-46, 51, November, 1976. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Costs, *Pollution abatement, *Industrial wastes, *Waste water treatment, Cities, Water purification, Nitrification, Activated sludge, Filtration, Adsorption, Water pollution sources, *Pre-treatment(Water).
Identifiers: Niagara Falls(NY).

Pretreatment of industrial wastes and reuse of existing municipal facilities have reduced costs at a new treatment facility in Niagara Falls, New York. Alteration in treatment processes were investigated in 1971 due to the discharge into the river of 164 mgd of waste water by industries involved in electrochemical, electrometallurgical, paper, food, organic chemical, and abrasive products. Water quality standards were instituted for effective disinfection; substantial removal of settleable and flotable solids; an effluent phenol concentration of less than 5 ppb; a pH of 6.7-8.5; a minimum dissolved oxygen concentration of 4 ppm; and the maximum possible removal of phosphates. A physical-chemical process using activated carbon for filtration and adsorption was used. The plant has a 48 mgd capacity and is located on the site previously used by a power generating facility. The tailrace tunnel of the power plant was rehabilitated to be used as an outfall and a 210,500-foot-long, six-foot-diameter, concrete-lined rock tunnel intercepting sewer was constructed. Cost savings resulted from early industrial cooperation to reduce pollution; the joint treatment facility which created economy of scale savings; the reuse of the tailrace tunnel of the power plant; the use of parts of the city's former treatment plant foundation for the new pumping station; the regeneration of exhausted carbon used for filtration and adsorption; and the use of plant effluent to backwash carbon. The toxic effects of chemical wastes on microbial populations precluded biological treatment, so the physical-chemical system was used. Sludge is disposed in landfills. This arrangement allows nitrification, conventional activated sludge and contact stabilization, or combinations of any two processes. (Collins-FIRL)
W77-08633

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
P. J. Matthews.
The Public Health Engineer, Vol 5, No 2, p 31-37, March, 1977. 3 tab, 49 ref.

Descriptors: *Water quality standards, Sewage effluents, Estuaries, Coasts, Water purification, Industrial wastes, Electrolysis, *Waste water treatment.
Identifiers: England.

Applying variouss physico-chemical treatment (PCT) methods to wastes which would be discharged to estuaries and coastal waters in England was considered. There has been a continuing argument for and against treatment of wastes for this type of disposal. Those in favor of treatment stress that oceans must be protected, and that treatment would diminish disease, eliminate long outfalls conflicting with other water uses, and remove certain pollutants which would otherwise persist. Those opposing treatment emphasize that great amounts of oxygen in the sea purify wastes, and that dilution renders the waste similar to biologically treated effluent. They add that costs are less for operating an outfall and that a well-sited outfall is less aesthetically objectionable. PCT was used in the nineteenth century, but biological treatment outweighed it by appearing more effective and by producing a more easily disposable sludge. Chemicaly aided sedimentation can be of use, however, where there is a solids standard of 60 to 150 milligrams/liter of suspended solids, or where this standard and a BOD and/or a COD limit are appropriate. The most common systems of chemical sedimentation include lime, ferric and ferrous salts, alum alone or with anionic polyelectrolytes, and cationic polyelectrolytes. These can be added before wastes undergo flocculation chamber followed by sedimentation tank treatment, or before combined flocculation/sedimentation tank treatment. The sludges produced are less filterable than primary sludges, but they can be treated, disposed of, or used in agriculture. Lime seems to be the most cost effective coagulant/flocculant. Partial treatment allows for shorter effluent pipelines than needed for crude sewage outfalls. Higher hydraulic loadings permit reduced sedimentation tank size and reduced sedimentation capital costs. The drawbacks to lime treatment are possible increases in capital costs by as much as 200% and in operating costs by 10-20% over sedimentation costs. Finally, the effects of coagulants, flocculants, and their impurities on effluent quality and sludge production must be considered. (Collins-FIRL)
W77-08634

SEWAGE TREATMENT IN DEVELOPING COUNTRIES,
Loughborough Univ. of Technology (England).
J. Pickford.
Water Pollution Control, Vol 76, No 1, p 65-66, 1977. 1 tab.

Descriptors: *Sewage treatment, *Urban areas, *Water supply, Water quality, Water quality control, Sanitation engineering, Sewage disposal, Domestic wastes, Septic tanks, Separate sewers, Oxidation lagoons, Corrosion, Economics, Activated sludge, *Waste water treatment.
Identifiers: *Developing nations.

Factors associated with sewage treatment in developing countries were discussed. The high growth rate of urban populations is characteristic of most of these nations, and the phenomenon of shanty-towns is a growing problem. Approximately two-thirds of these urban populations have access to piped water, though it may be intermittent or from public standpipes. Empty pipes contribute to inward leekage of groundwater which may be polluted where there is inadequate sanitation. Excreta is usually handled by municipal treatment, but often water is insufficient for basic needs, and it cannot be spared for toilet flushing. Pit latrines, septic tanks, and aqua-privies all have some drawbacks. Nightsoil is often buried in trenches but is usually treated with sewage sludge and in aerated lagoons. Separate sewage systems are used because of the heavy rainfalls in most developing countries and sewage blockage is common, as are problems resulting from hot climates, such as sewer corrosion. Stabilization ponds are ideal for many of these nations because they are simple, requie easy maintenance, use little imported materials, and have no power requirements. Diffused-air activated-sludge treatment and biological filters can also be used, but capacity in tropical climates can be less than in temperate areas. (Collins-FIRL)
W77-08635

CONTROLLING SLUDGE BULKING,
D. Liu, K. Kwasniewska, and D. B. Cohen.
Water and Sewage Works, Vol 124, No 3, p 52-53, March, 1977. 3 fig, 4 ref.

Descriptors: *Sludge treatment, *Activated sludge, *Microorganisms, Chlorination, Dissolved oxygen, Performance, *Waste water treatment, Analytical techniques, Laboratory tests, Biological treatment, Chemical treatment.
Identifiers: *Sludge bulking, Filamentous microorganisms.

Filamentous microorganisms have contributed to the problem of activated sludge bulking. Various means used to control them include chlorination,

hydrogen peroxide treatment, increasing the dissolved oxygen of the return sludge, and reducing the sludge loading rates. A program was conducted to establish means for isolating these microorganisms from normal and bulking sludges. Testing revealed two compounds which had a high selective specificity for filamentous microorganisms: n-amyl alcohol (n-pentanol) and isoamyl alcohol. This provided the basis for procedures to isolate the microorganisms. Various amounts of n-amyl alcohol are added to four flasks containing a modified nutrient broth. The flasks are shaken to ensure homogeneity and one drop of bulking sludge is added to each. The broth is checked every 24 hours for the growth of filamentous microorganisms, after incubation at room temperature on a gyrotary shaker. If filamentous microorganisms growth is substantial the broth should be streaked on a pre-dried modified nutrient agar plant for microorganism isolation. A second procedure involves adding bulking sludge or normal sludge to a sterile test tube, and then adding n-amyl alcohol and sterile distilled water. These are mixed, allowed to stand at room temperature, and mixed again. Three samples are quickly plated onto the pre-dried modified nutrient agar plates. The plates are incubated until there is complete colony development. Biochemical and taxonomical tests may be performed or colonies may be transferred to modified nutrient broth without n-amyl alcohol to confrim the procedure. (Collins-FIRL)
W77-08636

THE USE OF PACKED BEDS IN WATER POLLUTION CONTROL,
K. E. Porter.
La Tribune du Cebedeau, Vol 30, No 398, p 30-42, January, 1977. 16 fig, 5 tab, 11 ref.

Descriptors: *Packed beds, *Design criteria, *Mass transfer, *Biological treatment, Water pollution control, Filtration, Microorganisms, Biochemical oxygen demand, Industrial wastes, Plastics, Mineralogy, Organic matter, Separation techniques, Water purification, Treatment facilities, Costs, Physicochemical properties, *Waste water treatment, Performance, Evaluation.

Various types and designs of packed beds, as well as design criteria and mass transfer mechanisms used in water pollution control were described. The filter bed process generally involves two settling tanks with an intermediate filter treatment step. Microorganisms which consume the organic pollutant, in packed filter beds, grow over the surfaces of the packing as a film. The biomass removes BOD and becomes the solid product to be settled out. Packed beds are economical in situations where there is high BOD and/or high BOD concentrations maintained throughout the packed bed. Higher organic loading on the packing produces lower treatment costs, but increases the chance of blockage. Mineral media have been traditionally used. Modern packings include plastics such as polystyrene, polypropylene, and polyvinyl chloride, and various forms of vertical sheets and vertical tubes which allow organic loading to be increased about twenty times that used with the traditional packing. Packed beds are used to partially treat industrial wastes and industrial waste waters that cannot be treated with activated sludge methods, and to increase the capacity of existing sewage plants. Design techniques are reviewed with data on design criteria. Equations are presented for the biochemical rate and limiting solutions for diffusion and reaction in the biomass film, and for boundary conditions. Factors involved in the derivation of design equations were also considered. (Collins-FIRL)
W77-08637

OZONE DISINFECTION OF SECONDARY EFFLUENT,
PCI Ozone Corp., West Caldwell, N.J.
L. J. Bollyky, and B. Siegel.
Water and Sewage Works, Vol 124, No 4, p 90-92, April, 1977. 5 fig, 2 tab, 5 ref.

Descriptors: *Ozone, *Disinfection, Performance, Evaluation, Costs, Coliforms, Design criteria, Water quality control, Oxidation, Chemical reactions, Chlorination, Domestic wastes, *Waste water treatment, Effluents.

A New York City treatment facility was the site of a demonstration project for the disinfection of secondary effluent by ozone. Influent at the plant was of domestic origin. A disinfection level of 200 fecal coliform/100 milliliters was obtainable with an ozone dose of 1.75 milligrams/liter and a contact time of 3.5 minutes. The holding time was 10 minutes. Holding times were critical with low ozone doses because disinfection continues throughout that period. Costs should be reduced with low dose disinfection. Tests indicated that the performance of a well-designed diffusion system was equal to or better than a positive pressure injection or mechanical mixing system. Most disinfection occurred during the first four minutes of contact time when more than 2.5 ppm of ozone was present. Doses of less than 1.5 milligrams/liter were insufficient. Doses of 1.75 milligrams/liter with a 10-20 minute holding time produced the required disinfection. Most additional disinfection occurred during the first 10 minutes of holding time and little additional activity was found after 20 minutes holding time. Nearly complete destruction of fecal coliform was obtained with a 3.5 milligram/liter ozone dose and a 20 minute holding time. Increasing COD in a range of 22-34 milligrams/liter slightly reduced disinfection. Disinfection was also inhibited when suspended solids were increased in the range of 6-16 milligrams/liter. The quality of the influent waste water probably contributed to the success of these low doses. Further testing should be conducted to determine other influential factors. The availability of ozone for disinfection is determined by water ozone demand and chemical oxidation reaction rates. Other factors may include bubble size, diffuser pore size, water pressure, and surface tension. An economical approach to ozone usage might be the design of systems to allow the alternative of either ozone or chlorine disinfection. (Collins-FIRL)
W77-08638

SLUDGE TREATMENT: PROBLEMS AND SOLUTIONS, PART 1,
National Environmental Research Center, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.
J. E. Smith, Jr.
Water and Sewage Works, Vol. 124, No. 4, p 80-83, April, 1977. 5 fig, 7 tab.

Descriptors: *Sludge treatment, *Biological treatment, *Heat treatment, Anaerobic digestion, Aerobic treatment, Pathogens, Microorganisms, Dewatering, Filtration, Drying, Sludge disposal, Landfills, Incineration, Pollutants, Suspended solids, Biochemical oxygen demand, Heavy metals, *Waste water treatment.

Stricter waste water treatment effluent standards are expected to double secondary treatment sludges by 1985, and chemical sludges are expected to be produced in large quantities. Problems and suggested solutions were considered for future sludge treatment. The major concern is to evaluate process alternatives, to eliminate inappropriate methods, and to produce a total system of treatment. Various processes considered were sludge thickening, heat treatment, sludge conditioning, dewatering and filtration, and drying. Disposal techniques, such as landfilling and applying sludge agriculturally, were discussed. Mechanisms, chemical treatment, and resource recovery involved in municipal and various industrial sludge treatment procedures were evaluated. (Collins-FIRL)
W77-08640

COMPOSTING DESTROYS PATHOGENS IN SEWAGE SOLIDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
For primary bibliographic entry see Field 5E.
W77-08641

INSTRUMENTATION IMPROVES WASTE WATER TREATMENT PLANT CONTROL,
Rochester Water Reclamation Plant, Minn.
M. T. Skodje.
Public Works, Vol. 108, No. 4, p 88-90, April, 1977.

Descriptors: *Instrumentation, *Treatment facilities, *Monitoring, Equipment, Operation maintenance, Temperature, Dissolved oxygen, Sludge treatment, Analysis, Waste water treatment, Minnesota, Biological treatment.
Identifiers: Rochester(MI).

Research and pilot tests have resulted in more accurate design relationships for biological treatment processes. For these processes, such as trickling filter and activated sludge treatment, design formulas involve dissolved oxygen uptake rates, mixed liquor suspended solids, waste sludge concentrations, sludge wasting rates, return sludge concentrations, and sludge return rates. The operator can be aided by instrumentation which allows either rapid tests or continuous and reliable monitoring. Instrumentation testing has been undertaken by a Rochester, Minnesota, treatment plant for its expansion program. Fixed-probe dissolved oxygen meters and sonic sludge density controllers were tested. The plant contained parallel, rectangular plug-flow aeration tanks followed by circular clarifiers with peripheral feed and effluent collectors. Sensors were placed in the peripheral inlet channel of the clarifier, adjacent to the aeration tank inlet pipe, to obtain steady readings. These readings provide a correlation between inlet channel readings and desired aeration tank DO levels. Performance was very acceptable and cleaning of membrane surfaces and calibration were simple operations. Membrane replacement was not needed more than twice during the first year's operation. The sludge density controllers measured the absorption of sound waves transmitted across the pipe diameter. Installation was in a pipe line common to the primary tanks, where a mixture of primary and waste activated sludge was received. A shutdown control was set at a sludge density of 2.5%. A delay switch allowed up to 30 minutes pumping to clear the pipe of dilute sludge before the density unit would take control. The unit was reliable, but one with a visual indicator improved the instrument's value by inducing operator interest in its operation. So far only weekly flushing has been required for maintenance. Operation efficiency was greatly improved with these instruments. (Collins-FIRL)
W77-08642

RATIONAL DESIGN OF AEROBIC DIGESTION SYSTEMS,
Clemson Univ., S.C. Dept. of Environmental Systems Engineering.
L. G. Rich.
Water and Sewage Works, Vol. 124, No. 4, p 94-95, April, 1977. 1 fig, 1 tab, 2 ref.

Descriptors: *Aerobic treatment, *Design criteria, Suspended solids, *Biodegradation, Microorganisms, Biological treatment, Oxygen demand, Sludge digestion, Solid wastes, Temperature, Activated sludge, *Waste water treatment, Analysis.
Identifiers: *Aerobic digestion.

Equations were presented for various aspects of the design of aerobic digestion systems. The process is used to stabilize organic solids for discharge to the environment by converting the biodegradable-solids fraction to carbon dioxide, ammonia, and water. Operation may be carried out in three modes: batch, semi-continuous, and con-

tinuous. In the first, solids are aerated for the entire stabilization period, aeration is ended, and supernatant and settled solids are discharged. Aeration is discontinued more frequently in the second method, permitting solids settling, partial solids withdrawal, and the addition of new solids. The third mode is carried out in a single or multi-stage form. The addition of a clarifier-thickener after digestion is not generally feasible with the continuous-flow, multi-stage system. Hydraulic retention time should be based on average air temperatures for the coldest month. Diffused-air aeration systems contribute to temperature stability. The equations provide means for determining the relationship of specific oxygen uptake rate, temperature, biodegradable-to-nonbiodegradable volatile suspended solids ratio in the initial suspension, and the mean solids age. These are useful for a fundamental and predictable specification of the degree of stabilization. (Collins-FIRL)
W77-08643

THE EFFECT OF SURCHARGING ON DISCHARGE THROUGH A PIPE,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 8B.
W77-08644

SLUDGE INCINERATION,
For primary bibliographic entry see Field 5E.
W77-08717

NEW DIRECTIONS IN ION EXCHANGE,
Water Purification Associated, Cambridge, Mass.
C. Calmon, and H. Gold.
Environmental Science and Technology, Vol 10, No 10, October 1976, p 980-984, 2 fig, 3 tab, 5 ref.

Descriptors: *Ion exchange, *Reverse osmosis, Electrodialysis, Capital costs, Operating costs, Desalination, *Waste water treatment.
Identifiers: *Sirotherm process, *Materials recovery, Regenerants.

Two ion exchange processes have recently been applied on a commercial scale that eliminate the need for regenerant chemicals, while minimizing the quantity of dissolved salts in the effluent waste stream, or substantially reduce the quantity of regenerants, making it easier to recover the contaminante ions. The Sirotherm process can reduce dissolved salts by 80%. It does not require expensive regenerating chemicals, consumes small amounts of energy, and can be easily scaled up to larger units. Within certain limits, the process is competitive with reverse osmosis and electrodialysis. Performance data and the capital and operating costs for three typical installations are presented. Specific ion exchanges that are capable of reacting with specific ions in solution are discussed. The new exchangers make possible: the recovery of a specific material through the removal of trace contaminants from valuable chemical baths; the recovery of valuable materials present in trace amounts in solutions or rinses; the removal of toxic ions below their solubility limits as insoluble salts; an increase in the amount of water that can be treated for a fixed amount of ion exchanger; and a decrease in the chemical regenerant usage and in the amount of regenerant waste. (Nessa-NC)
W77-08719

SOIL TESTING FOR SLUDGE DISPOSAL.
For primary bibliographic entry see Field 5E.
W77-08728

NEOPLASTIC AND POSSIBLY RELATED SKIN LESIONS IN NEOTENIC TIGER SALAMANDERS FROM A SEWAGE LAGOON,
Texas Tech Univ., Lubbock. Dept. of Biological Sciences.
For primary bibliographic entry see Field 5C.
W77-08729

MAKE MONEY BY COMPUTER,
E. Watkins, and J. Burger.
The American City and County, Vol 92, No 4, p 57-58, April, 1977.

Descriptors: *Computers, *Costs, *Monitoring, Operating costs, Maintenance costs, Evaluation, Equipment, Cities, Water districts, Water quality control, Treatment facilities, Water rates, Waste water treatment, Florida.
Identifiers: Melbourne(FL).

Computerization was the solution to sewage collection problems created by the merger of Eau Gallie and Melbourne, Florida. Difficulties included meeting EPA regulations, conveying sewage in a level terrain to two treatment plants, and monitoring sealed overflow pipes on lift station wet wells. The computer used remot terminals at lift stations and distant treatment plants, and telemetric reports on operational and emergency conditions. Lift station terminals monitor water levels and control pump activity. Power failures and maintenance operations are also monitored. Infiltration/inflow data are collected to aid evaluation of future expansion needs. Operation and maintenance costs have been reduced and rate increases have been avoided by the installation of this system. A computerized billing system also reduced cost and billing errors. (Collins-FIRL)
W77-08730

THE DEVELOPMENT OF A TEST FOR THE POTABILITY OF WATER TREATED BY A DIRECT REUSE SYSTEM,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W77-08758

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN INDIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
C. C. Withee.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 810, Price codes: A14 in paper copy, A01 in microfiche. M.S. Thesis, 1975. 286 p, 52 fig, 61 tab, 61 ref, 2 append. OWRT A-021-COLO(4). 14-31-0001-5006.

Descriptors: *Colorado, Water utilization, Domestic wastes, *Waste water treatment, *Domestic water, *Waste identification, Septic tanks, *Water reuse, Waste disposal, Separation techniques.
Identifiers: Gray water treatment, Aerobic home sewage treatment units, Evaporation-transpiration beds, Home water reuse.

Disposal of wastewater from isolated homes in mountainous and rural locations in Colorado presents unique and difficult problems. The purpose of the study was to evaluate the flow and pollution patterns from individual homes and to evaluate existing and potential treatment methods. Field evaluation of home wastewater flow and pollutional characteristics was accomplished. The average per capita water use in the home was 44.4 gallons per day and the waste strength was 0.11 pounds per capita per day of BOD per person. Data for individual fixtures and appliances were obtained with measurement of many pollutional parameters. A brief evaluation of the home treatment methods was accomplished. Laboratory bench scale studies were made to evaluate methods for treatment of the soap related wastes in the home for reuse as toilet flushing water. (Bennett and Linstedt - Colo)
W77-08806

ELECTROCHEMICAL DETERMINATIONS OF TRACE QUANTITIES OF PHOSPHATE AND NITRATE,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.
W77-08817

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

DEWATERING CHEMICAL-PRIMARY SLUDGES,
Envirotech Corp., Salt Lake City, Utah. Eimco BSP Div.
D. Di Gregorio, and G. L. Shell.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. EE5, Proceedings paper No. 12474, p 1087-1106, October 1976. 8 fig, 10 tab, 7 ref. EPA 68-01-0183.

Descriptors: *Waste water treatment, *Centrifugation, *Lime, *Dewatering, Cost analysis, Economic efficiency, Evaluation, Equations, Treatment facilities, Size, Sludge, Sludge treatment, Filtration.
Identifiers: *Vacuum filtration, *Alums.

The efficiency and the cost of dewatering lime- and alum-generated physical-chemical treatment sludge were developed utilizing a continuous vacuum filter and a solid bowl conveyor centrifuge. Centrifugal dewatering included evaluation of both single-stage and two-stage classification dewatering. The evaluation of the data showed that lime recovery was economical with both a single and two-state centrifugal as well as vacuum filter above the plant size of 25,000,000 gal/day. Tables show the comparative cost of dewatering the lime and alum sludges for various sizes of treatment plants and with costs itemized for capital and operating considerations. Vacuum filters are the least-cost approach based on the results of the field studies. The paper also shows the process effects of varying operating parameters for these centrifuge and vacuum filter operations. (Bell-Cornell)
W77-08865

TRICKLING FILTER-ACTIVATED SLUDGE COMBINATIONS,
Rieke, Carroll, Muller Associates, Inc., Hopkins, Minn.
R. F. Roskopf, J. C. Young, and E. R. Baumann.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, Proceedings paper No 12460, p 1005-1018, October 1976. 8 fig, 4 tab, 28 ref.

Descriptors: *Sewage treatment, Treatment facilities, *Trickling filters, *sludge disposal, *Sludge treatment, *Activated sludge, *Waste water treatment, Water quality control, Hydraulics, Biochemical oxygen demand, Effluents.

Activated sludge processes were used on a pilot-plant scale as a means of upgrading trickling filter plants treating domestic wastewater. Parallel use of units provided increased hydraulic capacity and produced effluent BOD concentrations consistently below 25 mg/l. Series activated sludge-trickling filter or trickling filter-activated sludge processes produced effluent BOD consistently below 15 mg/l. This performance was maintained in all cases when operating at organic loadings up to about 50 lb BOD/day/1,000 cu ft (0.80 kg/day/m 3) of treatment unit volume. (Bell-Cornell)
W77-08868

ROLE OF NITROGEN IN ACTIVATED SLUDGE PROCESS,
Pittsburgh Univ., Pa. Dept. of Civil and Environmental Engineering.
Y. C. Wu.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No EE5, Proceedings paper No 12454, p 897-907, October 1976.

Descriptors: *Activated sludge, *Waste water treatment, *Water pollution control, *Chemical oxygen demand, *Biochemical oxygen demand, *Nitrogen, *Sludge disposal, Proteins, Carbohydrates, Phosphorus, Respiration, Kinetics, Equations.
Identifiers: Oxygen utilization.

Study of the effect of nitrogen limitation on metabolic activities of activated sludge has been conducted by utilizing a completely mixed continuous flow bench-scale activated sludge unit. The system was operated at various dilution rates with and without cellular recycle and was maintained at a constant temperature, 26 plus on minus 1C, and pH of 6.5. The results show that the concentration of nitrogen in the feed will significantly affect the contents of sludge phosphorus, sludge protein, and carbohydrate, as well as the morphological configuration of sludge organisms. However, the results obtained from the system with cellular recycle show that the substrate utilization rate and sludge yield coefficient are independent of nitrogen concentration in the feed. The rate of oxygen utilization is higher in the nitrogen-rich activated sludge system than in the nitrogen-deficient activated sludge system, but the endogenous respiration rate constant is identical in both systems. (Bell-Cornell)
W77-08869

METHOD OF PURIFYING WASTE WATER,
Feldmuhle Anlagen- und Produktions-gesellschaft m.b.H., Duesseldorf-Oberkassel (West Germany). (Assignee).
T. Ploetz, U. Haupt, and E. Solich.
Patent No 3,998,730, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 953, No 3, p 1153, December 21, 1976.

Descriptors: *Patents, *Waste water treatment, *Water quality control, *Organic wastes, Lignin, Industrial wastes, Hydrogen ion concentration, Separation techniques, Pulp and paper industry, *Pulp wastes.
Identifiers: Granular alumina, Aluminum ions.

The purification of waste water from lignin and its derivatives formed during the manufacture and processing of wood pulp, and particularly to an improvement in the purification of such waste water by contact with granular alumina is described. It has now been found that the loss of alumina into the purified water can be reduced sharply by mixing aluminum ions with the water prior to contact with the alumina at a pH not greater than 7 at which the aluminum ions are soluble in the water. When aluminum ions are added to the waste water prior to contact with the alumina, the capacity of the alumina is enhanced and its dissolution is repressed. The aluminum ions are mixed with the waste water preferably in the form of the aluminum salts of acids strong enough to lower the pH of the waste water. The waste water purified by this method may still contain formic acid, acetic acid, and monosaccharides which are readily decomposed by conventional exposure to microorganisms. (Sinha-OEIS)
W77-08881

METHOD FOR PURIFYING WATER OF ORGANIC COMPOUNDS NOT READILY BIODEGRADABLE,
Feldmuhle Anlagen- und Produktions-gesellschaft n.b.H., Duesseldorf-Oberkassel (West Germany). (Assignee).
H. Solbach, and H. Foerster.
U.S. Patent No. 3,998,732, 7 p, 2 fig, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 953, no 3, p 1153, December 21, 1976.

Descriptors: *Patents, *Waste water treatment, *Organic wastes, *Water purification, *Pulp wastes, Water pollution sources, Lignins, Absorption, Pulp and paper industry.
Identifiers: Alumina grains, Al203.

This invention relates to the purification of waste water, and particularly to the removal of organic compounds which are not readily bio-degradable from water by adsorption on granular forms of Al203. For adequate contact of the waste water with a sufficient amount of alumina grains, it is necessary to employ a multiplicity of adsorption columns in which a maximum concentration ratio of granular alumina to water must not be exceeded. Because of the turbulence which keeps the granular adsorbent in suspension, it is not possible to hold the alumina grains in a fixed position. The selected grain size of the porous alumina is essential for successful operation of the method of the invention because it avoids clogging of the passages between the grains, yet still provides an adequate adsorbent surface. The flow velocity at which the waste water to be purified is passed through an adsorbent column has a major influence on the effectiveness of the process. The contact between the water to be treated and the alumina grains is to be maintained for 30 minutes to 2 hours and the contact time varies with the nature of the waste water.
W77-08883

METHOD AND APPARATUS FOR PURIFYING AQUEOUS STREAMS CONTAMINATED WITH ORGANIC MATERIALS,
BASF Wyandotte Corp., Mich. (Assignee).
K. K. Ladha, W. M. Herring, and J. F. Louvar.
U.S. Patent No. 4,000,065, 13 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1609, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, Water pollution control, *Water purification, Water quality control, *Organic wastes, *Reverse osmosis, Separation techniques, Pressure, Equipment, *Filtration.
Identifiers: *Ultra-filtration.

Aqueous streams contaminated with minor amounts of organic materials are separated into an aqueous fraction which is concentrated with respect to the organic contaminants and a water fraction relatively free of the organic contaminants by a method which includes a combination of reverse osmosis (RO) and ultra-filtration (UF). The organic contaminants include substances having molecular weights of less than 10,000 which are soluble in the aqueous stream initially but have limited solubility ranges and are precipitated upon concentration. The contaminated aqueous stream is circulated from the high pressure compartment of a RO unit to the high pressure compartment of an UF unit, then to the low pressure compartment of the UF unit, and then back to the high pressure compartment of the RO unit. The contaminants are concentrated in the high pressure compartment of the RO unit, and a portion of it is precipitated or otherwise rendered amenable to removal along with the UF concentrate upon passing the RO concentrate from the high pressure compartment of the RO unit to the high pressure compartment of the UF unit. Soluble organic contaminants remaining in the aqueous stream are removed in the UF permeate and are recycled back to the high pressure compartment of the RO unit for further concentration and precipitation, followed by recycling to the high pressure compartment of the UF unit for removal. (Sinha-OEIS)
W77-08889

POLLUTED WATER PURIFICATION,
Phillips Petroleum Co., Bartlesville, Okla. (Assignee).
W. T. Nelson, and H. D. Holtz.
U.S. Patent No. 4,000,068, 4 p, 3 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1611, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water quality control, *Water purification, Organic wastes, Chemical wastes, Industrial wastes, *Oxidation.
Identifiers: Cupric nitrate.

A process is provided for converting water contaminated with organic materials to a potable aqueous product by contacting contaminated water under oxidation conditions with a water soluble copper salt such as cupric nitrate under conditions sufficient to convert the organic materials to innocuous materials so that the aqueous stream which has been substantially freed of contaminating materials can be safely discarded or reused. The water soluble copper salt catalyst of the invention is cupric nitrate. The process of the invention can be carried out under a variety of conditions depending upon the feedstock, cupric ion concentration, temperature, desired degree of organic removal, and other conditions. (Sinha-OEIS)
W77-08890

METHOD FOR PURIFYING WASTE WATERS WHICH CONTAIN ANIONIC-TYPE ORGANIC COMPOUNDS,
Anic S.p.A., Palermo (Italy). (Assignee).
R. Fusco.
U.S. Patent No. 4,000,069, 3 p, 4 ref; Official Gazette of the United States Patent Office, Vol 953, no 4, p 1611, December 28, 1976.

Descriptors: *Patents, *Waste water treatment, *Water treatment, Water quality control, *Water pollution treatment, Organic wastes, Chemical precipitation, Dyes.
Identifiers: Bis-triarylphosphonium, Textile industry.

A method for the purification of waste water which contains organic compounds of an anionic nature exploits bis-triarylphosphonium salts. With the use of salts of bis-triarylphosphonium saline compounds are formed, which are very poorly soluble, with organic compounds of an anionic nature, the latter being thus quickly precipitated. The salts in question supply very poorly soluble saline compounds with numerous classes of dyes, provided that the latter possesses one or more sulphone groups in their molecules. This property can be exploited to precipitate, and thus to strip the dyes from the residual dyeing baths, especially when the dyestuffs in question cannot be stripped with the conventional organic precipitants. (Sinha-OEIS)
W77-08891

FLOCCULANT USE ON TANKERS,
Exxon Research and Engineering Co., Florham Park, N.J. Environmental Control and Safety Div.
For primary bibliographic entry see Field 5G.
W77-08906

EFFECTS OF PRIMARY TREATED AND BIOLOGICALLY STABILIZED KRAFT MILL EFFLUENTS ON THE , PRODUCTION, BIOMASS AND GROWTH RATES OF JUVENILE SALMONIDS IN THREE STREAM CHANNELS,
Oregon State University, Corvallis, Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W77-08921

PLANT SIZE INFLUENCE ON PERFORMANCE IN ACTIVATED SLUDGE SYSTEMS WITH AP-

PLICATION TO REGIONAL WASTEWATER TREATMENT PLANNING,
California University, Davis, Department of Civil Engineering.
T. R. Grovhoug.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 983, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, (1973). 50 p, 6 fig, 9 tab, 18 ref, append. (California Water Resources Center Project UCAL-WRC-W-476). OWRT B-173-CAL(1).

Descriptors: *Waste water treatment, *Sludge treatment, *Economic efficiency, Management, *Activated sludge, *Treatment facilities, Regional analysis, *Performance, *Planning.
Identifiers: *Regional wastewater treatment.

Plant performance data from 30 existing activated sludge plans of varying size were evaluated to determine the relationship between plant performance and plant performance stability as a function of plant size using effluent suspended solids concentration as a measure of plant performance and variability of effluent suspended solids concentration as a measure of performance stability. Judgment of the superiority of single, large plant or grouped, small plant systems was made based on these results. Following the data analysis portion of the study, a further comparison of single plant vs. multiplant wastewater treatment systems was made based on economic and operational considerations to serve the second purpose. The following conclusions may be made based on the results, (1) No relationship exists between plant size and plant performance for the plants studied. (2) Single plant treatment systems exhibit no apparent advantages over multiplant treatment systems. (3) Research is needed to evaluate performance capabilities of existing treatment systems. (4) A greater understanding of regional wastewater treatment management considerations should be obtained before further regional systems are developed. (Snyder-California, Davis).
W77-08928

ENZYMATIC TREATMENT OF DAIRY EFFLUENTS,
Nebraska Univ., Lincoln. Dept. of Food Science and Technology.
P. J. Bailey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 980, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, June 1977. 82 p, 10 fig, 21 tab, 67 ref. OWRT A-040-NEB(2). 14-34-0001-7058.

Descriptors: Water quality, Effluents, Water pollution, Enzymes, *Waste water treatment, *Dairy industry, Industrial wastes, Biodegradation, *Biochemical oxygen demand, Biological treatment.
Identifiers: *Enzymatic treatment.

The purpose was to examine waste from a local multi-purpose dairy for compositional analysis and organic strength and to apply enzyme technologies to achieve reduction in the BOD of dairy waste. Prior to the studies with enzymes, wastewater from a local dairy was collected, and its proximate composition was determined. Those effluent constituents which were found to contribute the greatest amount of BOD were chosen for enzymatic pretreatment. It was felt that specific enzymatic pretreatment of certain effluent constituents might reduce the BOD of dairy wastewater and thereby reduce the stress on sewage treatment facilities. It was concluded that the enzymatic prehydrolysis of effluent constituents did not lower the BOD or the COD of dairy wastewater and did not increase BOD removal efficiencies in an activated sludge plant; however, the enzyme lactose dehydrogenase would decrease the BOD and the COD of lactose, a major component of dairy wastewater.
W77-08937

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
For primary bibliographic entry see Field 5E.
W77-09064

REAL-TIME MEASUREMENTS OF AQUATIC NITROGEN,
Connecticut Univ., Storrs.
J. S. Mazurek.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 182, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, 1975. 48 p, 15 fig, 1 tab, 36 ref, 2 append. OWRT A-030-CONN(6), 14-31-0001-3007.

Descriptors: *Waste water treatment, *Sewage treatment, *Instrumentation, *Nitrogen compounds, Activated carbon, Anion exchange, Cation exchange, Nitrates, Ammonia, *Measurement, Pilot plants, Treatment facilities, Pollutant identification.
Identifiers: Real-time measurements, *Aquatic nitrogen, Model pilot treatment plant, Total nitrogen.

This research involves real-time measurements of aquatic nitrogen utilizing a nitrate (NO_3^-) probe, an ammonia (NH_3) probe and a pyrolysis/microcoulometric total nitrogen (TN) analyzer. Organic nitrogen can be estimated by difference (Org N) = (TN) - (NO_3^-) - (NH_3). The objectives are to evaluate the measurement system for real-time determination of aquatic borne nitrogen and to learn the nitrogen removals and interactions within a model pilot sewage and advance treatment plant. Utilizing the mentioned instrumentation, real-time measurements were obtainable within 15 minutes but when the sensitivity levels of the instruments are approached and relative errors increase, misleading estimations of organic nitrogen can occur. From statistical analysis (and % removal - % relative error) of data it is concluded that nitrogen is removed by secondary treatment /at least 18% to 28%/, by activated carbon /17% to 27%/, by anion exchange /1%/, and by cation exchange /10% to 25%/; nitrates are removed by anion exchange /13%/ and ammonia by cation exchange /20% to 38%/. The concept of real-time analysis is feasible and practical only after the causes of errors are quantitated and minimized. (de Lara-Conn)
W77-09095

PHOSPHATE AND NITRATE REMOVAL BY A GRASS FILTRATION SYSTEM FOR FINAL TREATMENT OF MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
J. N. Walter.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 171, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, August 1974. 57 p., 16 tab., 3 fig., 29 ref., append. OWRT B-054-PA(2), 14-31-0001-3931.

Descriptors: *Overland flow, *Waste water treatment, Seasonal, Effluents, Phosphates, Nitrates, Municipal wastes, Municipal water, *Filters, *Filtration.
Identifiers: *Grass filtration system, *Nitrate removal, *Phosphate removal, Waste water systems, Flow distance, Application frequency, Long contact time.

Effects of application rate, flow distance, and seasonal changes on phosphate and nitrate removal were evaluated. The higher rates of application had lower nutrient removals. The longer distances produced high degrees of renovation. Different seasons produced variations in treatment effectiveness because the hydrologic characteristics of the soil changed. Both phosphate and nitrate removals were low. The lower application rates and longer flow distances removed the greatest amount of phosphate; however, all of the phosphate removal values were low due to the short contact time with the soil. Nitrate removals were low because the well-drained soil on which the study was conducted prevented anaerobic conditions necessary for denitrification. The Winter series had more nearly impervious soil conditions than the other three. The most important finding was that for a Northeastern, moderately to well-drained soil, overland flow treatment, as conducted in this experiment, was not effective. The removal efficiencies obtained are not sufficiently high to warrant installing systems of this type. (Sink - Penn State)
W77-09100

5E. Ultimate Disposal Of Wastes

NITROGEN REMOVAL FROM SECONDARY EFFLUENT BY A LABORATORY SOIL COLUMN,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 5B.
W77-08607

PREDICTION OF NITROGEN TRANSFORMATIONS IN THE STORAGE LAGOON OF A LAND TREATMENT SYSTEM,
Massachusetts Univ., Amherst.
For primary bibliographic entry see Field 5D.
W77-08624

SLUDGE DISPOSAL IN THE NORTH WEST,
G. L. Symes, and A. P. Michaelson.
Water Pollution Control, Vol. 76, No. 1, p 50-58, 1977. 1 fig, 3 tab, 9 ref, 1 append.

Descriptors: *Sludge disposal, *Irrigation, Equipment, Planning, Analysis, Treatment facilities, Waste water treatment, Disposal, Land reclamation, Water districts.
Identifiers: North West Water Authority(England), Ocean disposal, Marine sanitation.

Sludge disposal in areas controlled by the North West Water Authority, England, was discusses. The most common method is disposal to agricultural land. Seventy-five percent of the treatment plants supply liquid sludge for this purpose. Transport is accomplished by road tankers discharging sludge through irrigation pipes and rain guns, fixed pipes laid beneath fields, and slurry tanker disposal. Disposal to lagoons and tips is declining. Raw sludge is mixed with bulk transported refuse, in one case, to form stable lagoons which, when dry, aid land reclamation. Ocean disposal is carried out by pumping to an outfall and by ship transport. One major problem is that of sludge disposal in the Greater Manchester area. Planning and investigative groups are presently devising schemes to alleviate this problem. (Collins-FIRL)
W77-08628

NEW PLYMOUTH SEWERAGE SCHEME,
For primary bibliographic entry see Field 5D.
W77-08632

SEWAGE SLUDGE INCINERATION SHOULD BE IMPROVED BY ADDITION OF NEWSPRINT PULP.
Water and Pollution Control, Vol 115, No 4, p 54-55, April, 1977.

Descriptors: *Incineration, *Pulp wastes, *Waste disposal, Performance, Equipment, Fuels, Vacuum filters, Municipal wastes, Flocculation, Polyelectrolytes, Testing, Waste water treatment, Cities, *Canada.

Increased treatment plant size, treatment centralization, and the growing lack of landfill areas have increased investigations into using incineration for sewage disposal in Canadian municipalities. The addition of pulped newsprint to sludge should provide several benefits. A drier cake with less than a 70% water content should result in fuel savings of about 50%. The newsprint fibers, amounting to 10% of cake weight, can act as fuel to reduce supplemental fuel source needs. Replacing lime with newsprint pulp would aid vacuum filtration and eliminate lime scale on pipes, equipment, and tanks. A pulper and a press would be the only added equipment necessary, and the $160,000 costs could be repaid in two years through fuel savings. A low-cost newsprint source would be necessary; a domestic newspaper collection scheme was proposed as one way to obtain a newsprint supply. Field tests were conducted to establish the best proportions of newspaper pulp to sludge ratio, and to determine the best polyelectrolyte to use as a flocculant before vacuum filtration. Other studies showed that sludge dewatering produced a sludge cake suitable for pressing. Full-scale testing of the process is currently underway. (Collins-FIRL)
W77-08639

COMPOSTING DESTROYS PATHOGENS IN SEWAGE SOLIDS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Environmental Health.
K. Kawata, W. N. Cramer, and W. D. Burge.
Water and Sewage Works, Vol. 124, p 76-79, April, 1977. 6 fig, 13 ref.

Descriptors: *Pathogenic bacteria, *Viruses, *Aerobic treatment, Temperature, Water purification, Bacteria, Growth rates, Nutrients, Waste disposal, *Sewage treatment, *Waste water treatment.
Identifiers: *Composting.

Composting can be most effective in the destruction of pathogens. Various past and present studies were used to describe the development of composting from its embryonic stages to its immediate state of usage. Many of the less industrialized nations have long used composting. Recently it has gained wider interest among the more industrialized, urbanized nations for their waste disposal programs. The most important factor in pathogen destruction by composting is the maintenance of temperature throughout the compost mass which will inactivate the organisms. In recent studies, Salmonella newport, Candida albicans, Ascaris lumbricoides, and poliovirus I were seeded in dewatered sludge. Results of activity in a fully aerobic and completely mechanized plant showed substantial organism reduction. Salmonella was inactivated at 60 C in 30 minutes, Candida at 70 C in 60 minutes, Ascaris at 60 C in 60 minutes, and poliovirus at 50 C in 30 minutes. Outdoor composting in windows produces a pile with a temperature similar to ambient temperature, although it can rise to 70 C in the center of the pile. The pathogens are destroyed deeper in the pile, but survive on the pile surface. Evidence suggested that there is a temperature zone at which bacterial growth is optimum. This growth may continue as long as proper nutrients are available. It was shown that some pathogens survive waste water treatment and are included in waste solids. Composting has been shown to be a good option for waste disposal and destruction of these pathogens. (Collins-FIRL)
W77-08641

CARBON ISOTOPIC STUDY OF THE FATE OF LANDFILL LEACHATE IN GROUNDWATER,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W77-08670

SLUDGE INCINERATION,
J. Jacknow.
Environmental Science and Technology, Vol 10, No 12, November 1976, p 1080-1082, 1 tab, 6 ref.

Descriptors: *Incineration, *Sludge disposal, *Environmental effects, Heat budget, Pesticides, Pathogenic bacteria, Viruses, Waste treatment, Waste disposal.
Identifiers: *Energy conservation, Land disposal, Heat balance, Energy costs, Health costs.

A synopsis of alternative sludge disposal techniques and their environmental impacts is presented by a consultant to the Water and Wastewater Equipment Makers Association. Energy saving systems in use today are discussed. Many present sludge incineration systems are meeting local and state particulate standards, which are more stringent than Federal standards. Mercury and lead are discharged, but at insignificant levels. Pesticides present in the sludge are destroyed in the incineration process at efficiency rates of between 94 and 99.9 percent. A process is discussed whereby the latent heat in incinerator flue gases is used to precondition sludge. This and other processes result in a positive heat balance in the incinerator that can be used to generate steam for other operations at the treatment plant. Twenty-five million BTU's per day can be recovered from an incinerator serving a community of 100,000 people. Incineration has been found to have fewer energy and health costs than land application. The ash from the incineration process is free from pathogens, viruses and pesticides. The metals in the ash have been converted to the less soluable oxide form. (Nessa-NC)
W77-08717

SOLID WASTE MANAGEMENT: A TEST OF ALTERNATIVE STRATEGIES USING OPTIMIZATION TECHNIQUES,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N.J. Div. of Urban Studies.
M. Greenberg, J. Caruana, and B. Krugman.
Environment and Planning A, Vol. 8, No. 5, p 587-597, August, 1976, 4 tab, 13 ref.

Descriptors: *Linear programming, *Solid wastes, *Waste disposal, *Domestic wastes, *Optimization, Analytical techniques, Systems analysis, Watersheds(Basins), Management, Incineration, Landfills, Energy, *New Jersey.
Identifiers: *Hackensack Meadowlands(NJ), Gas pyrolysis, Dry fuel technology, Fuel credits, Resource recovery, Energy recovery.

A linear program is developed that tests the efficacy of different solid waste disposal technologies, locations, and fuel credits for recovered energy. The research design focuses on the cost of continued centralized landfilling and the opportunity cost of choosing either dispersed landfilling or resource recovery strategies. Twenty-five watersheds in the Hackensack Meadowlands of New Jersey formed the geographical unit of analysis. Four disposal technologies were evaluated, including present practices, disposal at sites in other communities, dry fuel technology which recovers an energy by-product, and gas pyrolysis. High, medium and low revenue pictures were developed for the last two options in order to determine the threshold revenue at which the systems become economically feasible. A low price charged for use of a central site results in continuation of present practices. When costs rise 55 percent, pressures develop for alternative sites. A low revenue for recovered resources justifies at least one dry fuel plant. The optimization procedure assigns all of the region's wastes to dry fuel facilities when medium and high revenues are assumed. The gas pyrolysis system cannot compete economically with the dry fuel system at any fuel credit level. (Nessa-NC)
W77-08723

SOIL TESTING FOR SLUDGE DISPOSAL.
Compost Science, Vol. 18, No. 1, p 16-17, January-February, 1977.

Descriptors: *Sludge disposal, *Soil tests, Heavy metals, Fertilizers, Soil properties, Monitoring, Ultimate disposal, *Soil disposal fields, Soil analysis, Waste water treatment, Water reuse.

Graduate and undergraduate students at the Penn State School of Agronomy are investigating sludge disposal for agricultural use. Soil testing is part of their research. The method developed uses an ideal solution of macro elements in combination with a soil sample. The solution adds to the soil or adsorbs from it the basic elements needed for plant growth; excesses or deficiencies of these elements can be pinpointed by examination of the solution after it interacts with the soil. The type and amount of fertilizer needed to promote optimum growth can be determined, as can the presence of heavy metals in sludge fertilizer. Monitoring the use of sludge as compost will be much easier with these test methods. (Collins-FIRL)
W77-08728

DENSITY CURRENTS AND THEIR APPLICATIONS,
Catholic Univ. of America, Washington, D. C. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08844

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 5G.
W77-08910

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY--TEXAS: AREA DESCRIPTION,
National Marine Fisheries Service, Galveston, Tex. Gulf Coastal Fisheries Center.
For primary bibliographic entry see Field 2L.
W77-08916

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W77-08919

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WITH ALL THEIR SKILL...'
For primary bibliographic entry see Field 5G.
W77-08957

SAY GOODBYE TO OCEAN DUMPING,
For primary bibliographic entry see Field 5G.
W77-08969

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
For primary bibliographic entry see Field 6E.
W77-08981

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENT - PHASE I,
Massachusetts Univ., Amherst. Environmental Engineering.
D. D. Adrian, C. S. Chen, M. A. DiGiano, J. H. Baker, and J. T. Clayton.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 092, Price codes: A08 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 70, April 1976, 157 p, 20 fig, 35 tab, 115 ref. OWRT B-033-MASS(1), 14-31-0001-4092.

Descriptors: Sludge disposal, Soil physical properties, *Heavy metals, *Sewage disposal, *Nitrogen, *Sewage effluents, *Sewage lagoons, Infiltration, Permiability, *Waste water disposal, Percolation, Water reuse, Absorption.
Identifiers: Fragipan soils, New England soils.

This project was initiated in response to a concern about the suitability of various sewage effluent land disposal alternatives; findings of Phase I of the dual phase project are presented. The sources of greatest concern include sewage effluents applied to land as a 'living filter' and sludge from wastewater treatment plants. The following papers are presented: (1) Measurement of the Infiltration Properties of Fragipan Soils; (2) Experimental Study of Waste Effluent Infiltration through Soil Media; (3) Heavy Metal Reactions in Soils; (4) Modeling of Plant Uptake of Nitrogen; (5) Mathematical Modeling of Nitrification/Denitrification in a Wastewater Storage Lagoon of a Spray Irrigation System; and (6) Nitrogen Transformations in Storage Reservoirs. (See also W77-09064) (Lefferts-Mass)
W77-09063

SUITABILITY OF NEW ENGLAND SOILS IN ACCEPTING WASTE EFFLUENTS, PHASE II,
Massachusetts Univ., Amherst. Environmental Engineering.
D. D. Adrian, J. T. Clayton, M. E. Weeks, J. H. Baker, and F. A. DiGiano.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 093, Price codes: A07 in paper copy, A01 in microfiche. Massachusetts Water Resources Research Center, Amherst, WRRC Publication No. 86, December 1976, 134 p, 54 fig, 18 tab, 90 ref. OWRT B-038-MASS(1), 14-31-0001-5080.

Descriptors: Waste disposal, Sewage disposal, *Soil physical properties, Permeability, Sewage lagoons, *Waste water disposal, *Heavy metals, Water reuse, *Percolation, Soil engineering, *Nitrogen, Mathematical models, Sewage effluent.
Identifiers: New England soils, Fragipan soils, Land application.

This project was undertaken as a result of the controversy surrounding the disposal of treated waste effluent. Five papers are presented, each related to the fate of contaminants in a land disposal system operating on New England soils. Topics discussed are: (1) The distribution of fragipan soils in New England as well as the physical characteristics of these hardpan soils; (2) The reactions of heavy metals in wastewater applied to soils; (3) Nitrogen transformations in wastewater applied to soils; (4) A mathematical model related to nitrogen transformation during lagoon storage to help determine suitable loading rates in a land application system; (5) Utilization of a computer simulation of rainfall to investigate the importance of annual precipitation patterns in determining land application rates. (See also W77-09063) (Lefferts-Mass)
W77-09064

STORAGE OF LOW-LEVEL RADIOACTIVE WASTES IN THE GROUND: HYDROGEOLOGIC AND HYDROCHEMICAL FACTORS,
Geological Survey, Reston, Va. Water Resources Div.
S. S. Papadopulos, and I. J. Winograd.
Open-file report 74-344, 1974. 49 p, 1 fig, 43 ref, append.

Descriptors: *Radioactive waste disposal, *Underground waste disposal, *Water pollution control, *Hydrogeology, Reviews, Methodology, Evaluation, Geologic units, Aquifers, Groundwater movement, Path of pollutants, Model studies, Mathematical models.

The status of mathematical simulation techniques, as they apply to radioactive waste burial sites, is briefly reviewed, and hydrogeologic and hydrochemical data needs are listed in order of increasing difficulty and cost of acquisition. Predictive modeling, monitoring, and management of radionuclides dissolved and transported by ground water can best be done for sites in relatively simple hydrogeologic settings; namely, in unfaulted relatively flat-lying strata of intermediate permeability such as silt, siltstone and silty sandstone. In contrast, dense fractured or soluble media, and poorly permeable porous media (aquitards) are not suitable for use as burial sites, first because of media heterogeneity and difficulties of sampling, and consequently of predictive modeling, and second, because in humid zones burial trenches in aquitards may overflow. A buffer zone several thousands of feet to perhaps several miles around existing or proposed sites is a mandatory consequence of the site selection criteria. As a specific example, the Maxey Flats, Kentucky low-level waste disposal site is examined. (Woodard-USGS)
W77-09086

POPULATION RESPONSE AND HEAVY METAL CONCENTRATIONS IN COTTONTAIL RABBITS AND SMALL MAMMALS IN WASTEWATER IRRIGATED HABITATS,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5B.
W77-09097

THE EFFECTS OF WASTEWATER IRRIGATION ON THE ACTIVITIES AND MOVEMENTS OF SONGBIRDS,
The Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 5C.
W77-09098

DEER HABITAT RESPONSE TO IRRIGATION WITH MUNICIPAL WASTEWATER,
Pennsylvania State Univ., University Park. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W77-09099

PHOSPHATE AND NITRATE REMOVAL BY A GRASS FILTRATION SYSTEM FOR FINAL TREATMENT OF MUNICIPAL WASTE WATER,
Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5D.
W77-09100

5F. Water Treatment and Quality Alteration

THE DEVELOPMENT OF A TEST FOR THE POTABILITY OF WATER TREATED BY A DIRECT REUSE SYSTEM,
Cincinnati Univ., Ohio. Coll. of Medicine.
For primary bibliographic entry see Field 5A.
W77-08758

INFLUENCE OF INITIAL MIXING ON DIRECT FILTRATION,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. R. Sama.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 907, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, December 1974. 88 p, 24 fig, 7 tab, 30 ref. OWRT A-062-ILL(4). 14-31-0001-4013.

Descriptors: *Water treatment, *Flocculation, *Polyelectrolytes, Lake Michigan, *Mixing, *Filtration, Filters, Cations, Coagulation, Performance.
Identifiers: *Direct filtration, Organic polyelectrolytes, Mixing time, Filtration rate, Zeta potential measurements.

A literature review describes the history and development of direct filtration as a means for economical treatment of water with a low turbidity and compares the various procedures used. Experiments were conducted using a dual-media filter and a commercially available organic cationic polyelectrolyte coagulant. The primary objective was to study the effect of the mean fluid resident time and the mixing intensity in a continuous flow reactor on the length of the filter run. Polyelectrolyte concentrations of 2.0, 3.0 and 5.0 mg/l were used. Results are given for various operating conditions. At higher optimal values, the benefits resulting from increased deposit density are offset by increased deposition in the anthrocite-sand mixture region, when, because of the relatively lower initial porosity, deposition results in a relatively rapid head loss buildup and consequently shorter filter runs.
W77-08809

DIRECT FILTRATION OF LAKE MICHIGAN WATER,
Illinois Inst. of Tech., Chicago. Dept. of Environmental Engineering.
R. D. Tanner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 890, Price codes: A05 in paper copy, A01 in microfiche. Master's Thesis, May 1974. 74 p, 23 fig, 11 tab, 21 ref. OWRT A-062-ILL(3), 14-31-0001-4031.

Descriptors: *Water treatment, *Flocculation, *Polyelectrolytes, *Lake Michigan, *Filtration, Filters, Colloids, Coagulation, Cations, Turbidity, Pilot plants.
Identifiers: *Direct filtration, Cationic polyelectrolytes, Zeta potential measurements.

A review of current theories concerning the mechanisms of colloid destabilization and filtration mechanisms is discussed, and finally the current application of direct filtration is reviewed. Two identical pilot plant filters were set up to evaluate the clarification of Lake Michigan water when cationic polyelectrolytes were used as the sole coagulant. One filter served as a blank, receiving only chlorinated water while the other filter received polymer treated water. During the test period the influent water turbidies ranged from 0.65 to 35 FTU. After 6.5 hours of filtration the effluent turbidity was less than 0.10 FTU. Four cationic polyelectrolytes were tested. The head loss developed during a filter run varied significantly between each of the polymers studied due

to development of a filter cake by certain polymers. Head loss buildup was also a function of the influent turbidity and the polyelectrolyte concentration. It appears that direct filtration of Lake Michigan water with cationic polyelectrolytes as the sole coagulant might be a feasible alternative to the conventional water treatment plan. Additional research is needed when the turbidity is greater than 10 FTU.
W77-08812

PHOTOCHEMICAL DECHLORINATION OF WATER SUPPLY FOR FISH TANKS WITH COMMERCIAL WATER STERILIZERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
F. A. J. Armstrong, and D. P. Scott.
J Fish Res Board Can 31(12), p 1881-1886. 1974.

Descriptors: *Water treatment, *Chlorine, Fish, Habitats, Water supply.
Identifiers: *Dechlorination, Mercury, Lamp, *Photochemical, Dechlorination, Water, *Fish, Tanks, Chlorine removal.

Commercial Hg-lamp water sterilizers can be used for removal of free C12 in water supplies, by photochemical action. The efficiency of removal decreases with increasing pH, but is little affected by temperature. It is greatest at low initial C12 concentration. Equipment with either low or high presure Hg vapor lamps may be used. Removal of 90% of free C12 can be effected at about 13.01 min-1 with a sterilizer using 8 low presure lamps of 40 W, or at 50 1 min-1 or more with 2 1200-W sterilizers with high presure lamps in tandem. Treated water appears to be harmless to fish. — Copyright 1977, Biological Abstracts, Inc.
W77-08842

PHILADELPHIA'S WATER SYSTEM AUTOMATION PLAN,
Philadelphia Water Dept., Pa. Office of Water Commissioner and Chief Engineer.
C. F. Guarino, J. V. Radziul, A. Hess, P. R. Cairo, and R. E. Day.
Journal of the Environmental Engineering Division, Proceedings of the American Society of Civil Engineering, Vol. 102, No. EE5, Proceedings paper No. 12473, p 953-968, October 1976. 6 fig, 7 ref.

Descriptors: *Water distribution(Applied), *Water quality, *Water treatment, *Automation, Computers, Design, Comprehensive planning, Rivers, Control, Treatment facilities, Algorithms.
Identifiers: *Information systems, Nomographs, Waterworks.

Described is the development of a five-year master plan to implement a modern integrated total system automation of the City of Philadelphia's water treatment and distribution facilities, including associated components. Analytical instrumentation and other devices located in the rivers, the treatment process, and the distribution system provide information through communication links to process control computers. The data are analyzed by the master control computer which utilizes specially derived algorithms to determine adjustments of chemical feeds and process flows via supervisory control of the plant's equipment. Examined is the multidisciplined approach taken to solve the problem. Considered are: a review of the treatment processes; strategies for improving treatment methods; the development of the five-level hierarchical control structure; and the derivation of advanced control strategies for computer-based process control and management. (Bell-Cornell)
W77-08864

5G. Water Quality Control

QUANTITATIVE AND QUALITATIVE IMPLICATIONS OF URBAN STORM RUNOFF ABATEMENT MEASURES,
Pennsylvania State Univ., University Park. Dept. of Civil Engineering.
G. Aron, D. A. Long, A. C. Miller, and M. J. O'Brien.
Available from the National Technical Information Service, Springfield Va as PB-268 777, Price codes: A06 in paper copy, A01 in microfiche. Research Publication 97, Institute for Research on Land and Water Resources, University Park, PA., December 1976. 101 p, 18 tab, 23 fig, 52 ref. 3 append. OWRT B-076-PA(2), 14-0001-5108.

Descriptors: *Planning, *Computer models, *Storm runoff, *Storm water, Surface runoff, *Urbanization, *Floods, *Urban drainage, *Urban hydrology, Urban runoff, Water quality, Management, Model studies.
Identifiers: *Urban runoff models, *Total watershed response, *Runoff quality, Subarea flow, Quantity of stormwater runoff, Hydrologic budget models.

Stormwater detention devices can be effective in reducing downstream problems as a result of urban development and they can be compatible with their surroundings. Problems can arise with stormwater detention devices especially if they are not constructed or maintained properly. Some devices are environmentally more acceptable than others in cerain areas, but there should be no problems which cannot be handled with adequate planning. Uraban runoff models are becoming more refined and reliable with use, but they still have a long way to go. They will, however, continue to be an important tool to the engineer and planner in the future. The decision-making process in regard to urban storm-water management and non-point source pollution control is severly hampered by the lack of good real-time data on both urban runoff quantity and quality. The present market demand for stormwater monitoring equipment has resulted in a desirable research effort into the development of more reliable equipment at lower cost. (Sink-Penn State)
W77-08602

ADVANCED WASTE TREATMENT DESIGN PROTECTS LAKE ALTON,
E. Maran, and D. J. Sulick.
Water and Sewage Works, Vol 124, No 4, p 68-69, April, 1977. 1 fig, 1 tab.

Descriptors: *Treatment facilities, *Water pollution control, Lakes, Activated carbon, Incineration, Biological treatment, Chemical treatment, Oxidation-reduction potential, Ammonia, Disinfection, Chlorination, Chemical reactions, Water purification, *Waste water treatment, *Tertiary treatment.
Identifiers: St Charles(MO), *Lake Alton(MO).

An advanced treatment system was used to produce a high quality effluent for discharge into Alton Lake, near St. Charles, Missouri. The lake was created by the construction of a flood control lock and dam on the Mississippi RIver, and is used for recreational purposes. The city's 5.5 mgd primary treatment plant was upgraded by the addition of activated sludge treatment and granular carbon adsorption. The entire system consists of a bar screen, comminutor, aerated grit chamber and primary clarifier, four aeration basins, and two secondary clarifiers. The sludge is thickened, filter pressed, and incinerated. Secondary clarifier effluent is pumped to the granular carbon system which functions as a suspended solids filter and adsorbs dissolved organic chemicals. The carbon life in each adsorber is about 200 days. The carbon is exhausted at a rate of nearly 200 pounds/miligram of waste water treated. Spent carbon is fed into a multiple hearth furnace operated at about 1650 F and fueled by natural gas or No. 2 fuel oil. The furnace has an afterburner and wet scrubber for complete organic matter combustion and removal of particulates from exhaust gases. Reactivated carbon is water-quenched and educted to an adsorber for reuse. A 5 to 7% carbon loss results from handling and reactivation. The design of the system provides for conversion of the plant to physical-chemical treatment in case of biological process failure. Chlorination is provided before and after carbon adsorption to reduce plugging of the carbon beds from the physical carryover of excess secondary slime growths, and to aid oxidation-reduction reactions of mono- or dichloroamines formed by free ammonia conversion at breakpoint chlorination. These reactions do not interfere with carbon adsorption properties. Carbon post-chlorination is for disinfection. (Collins-FIRL)
W77-08631

APPLICATION OF PHYSICO-CHEMICAL TREATMENT AS A METHOD OF ACHIEVING PARTIAL STANDARDS ON SEWAGE EFFLUENTS DISCHARGED IN ESTUARIAL AND COASTAL SITUATIONS,
Anglian Water Authority, Huntingdon (England). Directorate of Scientific Services.
For primary bibliographic entry see Field 5D.
W77-08634

GET READY FOR DUAL WATER SYSTEMS,
Weston Environmental Consultants-Designers, West Chester, Pa.
A. K. Deb.
Water and Wastes Engineering, Vol. 14, No. 4, p 88-89, 91-92, April, 1977. 3 fig, 2 tab, 5 ref.

Descriptors: *Water supply, *Domestic water, Water quality control, Municipal water, Water consumption(Except consumptive use), Industrial water, Cities, Water use, Water purification, Water demand, Treatment facilities, Model studies, Costs, Recycling.
Identifiers: *Dual water supply systems.

Technological advances are increasing the probability of dual water systems and mathematical models have been developed for the costs involved in these systems. If the current rate of increased water demand, population growth, and development of chemicals which enter natural waters continue, the quality of water will decline and high quality supplies of domestic water will not remain at present levels. It is important to understand that a majority of water uses do not require the quality levels of potable water. It was suggested that a hierarchy of water use and relative quality levels be established. The supply of two or more water grades should be considered. Separate systems could be used to supply potable water and non-potable water. A higher quality level of water treatment, including disinfection, would be necessary for potable water, but non-potable water would receive treatment somewhat similar to present levels. Benefits would include lowered public health risks and water conservation. Dual systems are being used in various locales at present. An English system separates domestic (potable) and industrial (non-potable) water and, in Singapore, part of filtered waste water is used for industry and toilet flushing. A plan for St. Petersburg, Florida, would use reclaimed municipal water for lawn sprinkling. Non-potable water in dual systems should nevertheless be of such quality that accidental or inadvertent ingestion would not cause harm. (Collins-FIRL)
W77-08645

PLANASA--A NATIONAL PLAN FOR WATER SUPPLY AND SEWERAGE IN BRAZIL,
Banco Nacional da Habitacao, Rio de Janeiro (Brazil).
For primary bibliographic entry see Field 6E.
W77-08646

TOTAL ENERGY USE IN AN URBAN-AGRICULTURAL POWER PLANT COMPLEX,
Oregon State Univ., Corvallis. Dept. of Soil Science.
L. Boersma, L. R. Davis, and J. C. Ringle.
In: Thermal and Chemical Problems of Thermal Waters, Proceedings of the Grenoble Symposium, August/September, 1975. p 135-143, 1 fig, 2 tab, 19 ref.

Descriptors: *Geothermal studies, *Heated water, Powerplants, Agriculture, *Energy.

The rationale for agricultural applications of warm water appearing as waste heat from power generating plants or from geothermal waters is described. Because it is available over a wide temperature range, the use of geothermal water is identified as being particularly attractive. It was concluded that the use of warm water to satisfy existing and future energy needs should be developed. (See also W77-08677) (Chilton-ORNL)
W77-08691

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-08711

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
For primary bibliographic entry see Field 6B.
W77-08713

EXPERIMENTAL DATA ON THE REGULATION OF 1,2-DIBROMOPROPANE IN RESERVOIR WATER, (IN RUSSIAN),
For primary bibliographic entry see Field 5C.
W77-08718

MAKE MONEY BY COMPUTER,
For primary bibliographic entry see Field 5D.
W77-08730

REACTIONS IN THE AQUEOUS ENVIRONMENT OF LOW MOLECULAR WEIGHT ORGANIC MOLECULES,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 5B.
W77-08754

THE MICROBIAL DEGRADATION OF AROMATIC PETROLEUM PRODUCTS,
Texas Univ. at Austin. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W77-08759

EFFECTS OF DIPOTASSIUM ENDOTHALL ON ROOTED AQUATICS AND ADULT AND FIRST GENERATION BLUEGILLS,
Wisconsin Dept. of Natural Resources, Woodruff.
For primary bibliographic entry see Field 5C.
W77-08785

SEGREGATION AND RECLAMATION OF HOUSEHOLD WASTEWATER AT AN INDIVIDUAL RESIDENCE,
Colorado Univ., Boulder. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5D.
W77-08806

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

MOVEMENT OF MANURIAL NITROGEN IN COOL, HUMID CLIMATES,
New York State Coll. of Agriculture and Life Sciences, Ithaca. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W77-08819

EFFECTS OF HYPOLIMNETIC AERATION ON NITROGEN AND PHOSPHORUS IN A EUTROPHIC LAKE,
Adelphi Univ., Garden City, N.Y.; and Adelphi Univ., Oakdale, N.Y. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W77-08824

THE DESIGN OF A SYSTEM FOR COLLECTING LEACHATE FROM A LINED LANDFILL SITE,
Toronto Univ. (Ontario). Dept. of Geophysics.
J. Wong.
Water Resources Research, Vol. 13, No. 2, p 404-410, April 1977. 7 fig, 1 tab 4 ref, 2 append.

Descriptors: *Landfills, *Waste disposal, *Leachate, *Model studies, Mathematical models, Garbage dumps, Waste dumps, Disposal, Solid wastes, Leaching, Drainage, Infiltration, Tiles, Drainage systems, Subsurface drains, Tile drains, Linings, Leakage, Water pollution, Water pollution control.
Identifiers: Leachate collecting.

A system for collecting leachate at the bottom of a landfill site was conceptualized, and the desigr. parameters for the system were specified. The core of the system is a sloped low-permeability earthen liner that deflects downward infiltration to a series of collector tiles. Equations were derived that describe the drainage and leakage processes on top of the leaky liner. A simple graphical procedure was developed to quantitatively evaluate the collection efficiency of the system. With the developed procedure, some implicatons of various options available to landfill design were examined. The main assumptions used in the model were examined critically to explain qualitatively the limitations of the model. (Sims-ISWS)
W77-08827

DESIGN EFFICIENCY OF STORMWATER DETENTION BASINS,
National Weather Service, Silver Spring, Md., Hydrologic Research Lab.
For primary bibliographic entry see Field 4D.
W77-08841

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
For primary bibliographic entry see Field 6B.
W77-08862

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
For primary bibliographic entry see Field 6B.
W77-08863

REAERATION AND VELOCITY PREDICTION FOR SMALL STREAMS,
Kentucky Univ., Lexington. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08867

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W77-08870

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08872

BARRIER FOR WATER CARRIED POLLUTANTS,
P. Preus.
U.S. Patent No 3,998,060, 6 p, 6 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 953, No 3, p 934, December 21, 1976.

Descriptors: *Patents, *Oil pollution, *Water pollution control, Water pollution treatment, *Barriers, Floating, Obstruction to flow, Adsorption, Absorption.
Identifiers: Oleophilic-hydrophobic material.

Floating barriers, known generally as oil booms, are found to have great utility in containing and controlling oil slicks and other water carried pollutants on and in bodies of water. This barrier is composed of a series of boom sections which are connectable in end to end relationship with each of the boom sections containing a flotation material which comprises an oleophilic-hydrophobic-lighter than water composition which will selectively absorb and/or adsorb hydrocarbons or other pollutants. The boom sections are connected to flexible draft members such as cables or chains which maintain the integrity of the boom even if it becomes necessary to replace one or more of the boom sections or to enlarge the area confined by the boom or to decrease such area by removing boom sections. In addition to the flexible draft members and associated connectors, the invention provides for fluid impervious connectors which engage opposed boom section ends and prevent the escape of the contained floating substance at each joint or connection. (Sinha-OEIS)
W77-08878

DETERGENT COMPOSITION FOR DISPERSING OIL SPILLS,
British Petroleum Co. Ltd., London (England). (Assignee).
P. M. Blanchard, and D. G. Meeks.
U.S. Patent No. 3,998,733, 5 p, 1 fig, 2 tab, 15 ref; Official Gazette of the United States Patent Office, Vol. 953, no 3, p 1153-1154, December 21, 1976.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution, *Water quality control, *Dispersion, Emulsions, Detergents, Organic compounds, Chemical reactions.

A dispersant composition can be dispersed in sea water at the time of spraying, the water acting as carrier. The dispersant composition can also be diluted with dearomatised kerosine. When the dispersant composition is to be diluted with sea water the composition can be sprayed from a vessel. When the composition is to be used to clear beaches it can be used dissolved in a suitably refined kerosine. Thus the composition can have a dual role. The detergent composition comprises an ester of a polyoxyethylene glycol ester of a C10-24 fatty acid, an organic sulphate or sulphonate deter-

gent, an alcohol or glycol of molecular weight 90-250. (SinhanOEIS)
W77-08884

FENDING DEVICE FOR OIL CONTAINMENT BOOM,
E. C. Nielsen.
U.S. Patent No. 3,000,532, 7 p, 11 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 108, January 4, 1977.

Descriptors: *Patents, *Oil pollution, *Oil spills, Water pollution, *Water pollution control, *Water quality control, Barriers, Equipment.
Identifiers: Fenders, Modular units, Containment.

Oil booms or barriers are in general use today for containing oil slicks floating on water. When oil booms are used in conjunction with vessels the boom must be held away from the hull of the vessel since a discharge from either above or below the waterline of the vessel will enter the plane of the water surface several feet away from the hull depending on the current and wind direction and velocity. The greater the distance of spacing of the boom, the better the likelihood of safe containment under most conditions. It is all imperative that the boom be kept away from the rotating propeller and destroyed with an attendant possibility of damage to the ship's propulsion gear. A durable fending device of suitable size for floating objects such as oil barriers is provided which has a maximum strength/weight ratio and is formed from a high strength material. It may be readily assembled from components of conventional shipping size by connecting them by standard fastening means into an efficient overall large span structure. (Sinha-OEIS)
W77-08892

SKIMMER FENCE,
Exxon Production Research Co., Houston, Tex. (Assignee).
U.S. Patent No. 4,000,618, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, Water pollution, *Water pollution control, *Water quality control, Oil pollution, *Skimming, *Barriers, Baffles, Floating, Engineering structures.
Identifiers: Containment, *Skimmer fences.

A barrier for use in a flowing stream of liquid accumulates floating material including petroleum products so that such material can be easily removed. The barrier may be used as a safeguard in locations, such as ravines or drainage ditches, which are normally dry but which might occasionally contain a flowing stream. The apparatus is designed to skim or control a flowing stream which may vary in depth from very shallow to deep water. The barrier includes a series of vertically 'stacked' baffles. When in operating position the barrier extends across the breadth of the stream and to any desired distance above and below the surface of the liquid. The baffles are spaced apart with each baffle overlapping a portion of the baffle adjacent to it to form a passageway between each baffle for flow of the stream through the barrier. In cross section each baffle may comprise two straight members perpendicular to and extending in opposite directions to a third straight member or each baffle may comprise a semicircle in cross section. (Sinha-OEIS)
W77-08893

REMOTE SEALING OF MINE PASSAGES CONTAINING FLOWING WATER,
Department of the Interior, Washington, D.C. Office of the Secretary.
K. R. Maser.
U.S. Patent No. 4,000,621, 4 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Underground streams, *Subsurface water, *Mine water, Tunnels, Underground structures, Boreholes, Sealants.

There is often need to construct seals within underground passageways such as mine drifts or tunnels. Access to the seal site may be hazardous and often times impossible. This invention describes how a seal may be remotely constructed in an underground passage having water flowing by providing a diversion path for the water during construction of the seal and thereafter closing off the diversion path. This is accomplished by drilling at least one borehole communicating from the surface to the passage through which a first layer of sized aggregate is placed on the passage floor to allow percolation of the flowing water through the aggregate layer without water overflowing the layer. A dry sealing material, which may comprise fly ash alone or mixed with cement or a swelling clay such as bentonite, is then pneumatically placed on top of the aggregate layer. Then a cementitious grout is injected into the aggregate layer to close off the water flow path and complete the seal. (Sinha-OEIS)
W77-08896

FLOCCULANT USE ON TANKERS,
Exxon Research and Engineering Co., Florham Park, N.J. Environmental Control and Safety Div.
J. E. Shewmaker.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-251 626, Price codes: A03 in paper copy, A01 in microfiche. Report EE.5TMR.76 to U.S. Maritime Administration, March 1976. 48 p, 5 fig, 9 tab, 10 ref, 4 append. C-1-35049.

Descriptors: *Flocculation, *Water pollution control, *Oil pollution, *Pollution abatement, *Waste water treatment, *Separation techniques.
Identifiers: Tankers.

The results of shipboard studies of flocculants to improve oil-water separation in tanker slop tanks is presented. Experiments were performed in matched pairs of slop tanks. Montmorillonite clay in fresh water and a clay activator were mixed into the slop waters at levels of 100 mg/kg (ppm) and 20 mg/kg (ppm), respectively. Flocculation improved the oil-water separation at a very rapid rate. After the best method of application, flocculant-treated slop water contained about 20-50 mg/kg (ppm) of oil compared to several hundred mg/kg (ppm) in the control tank undergoing unaided gravity separation. Since flocculation would require supplying and handling of additional materials as well as operational effort, other methods of achieving oil-water separation may be preferred. Unanswered questions concerning flocculant use include the fate and effects of the clay and the economic recoverability of flocculated oil. (Sinha-OEIS)
W77-08906

A BIODEGRADATION OF OIL ON WATER SURFACES,
Office of Naval Research, Arlington, Va.
R. Bartha.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-000 722, Price codes: A02 in paper copy, A01 in microfiche. U.S. Patent Application No 558,040, 13 March 1975. 14 p, 1 fig.

Descriptors: *Oil spills, *Oil pollution, *Biodegradation, *Microbial degradation, *Water pollution treatment, Microorganisms, Patents.
Identifiers: *Outer Continental Shelf.

Free-floating oil slicks on bodies of sea and fresh water are disposed of by microbial degradation at a greatly enhanced rate by apply the essential microbial nutrients, nitrogen and phosphorus, to the oil slick in a form that dissolves in or adheres to the oil and thus selectively stimulates the activity of oil-metabolizing microorganisms. (Sinha-OEIS)
W77-08909

AGENTS, METHODS AND DEVICES FOR AMELIORATION OF DISCHARGES OF HAZARDOUS CHEMICALS ON WATER,
Rensselaer Polytechnic Inst., Troy, N.Y.
W. H. Bauer, and J. J. Bulloff.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-024 221, Price codes: A13 in paper copy, A01 in microfiche. U.S. Coast Guard Office of Research and Development Report No CG-D-38-76, August 1975. 285 p, 23 tab, 583 ref, 2 append.

Descriptors: *Oil spills, *Hazards, *Water pollution control, *Pollutant identification, *Water pollution treatment, *Oil pollutants, Waste disposal, Chemical wastes.

Chemical agents and methods advantageous for the amelioration of discharges of 30 representative hazardous chemicals on water were identified and evaluated. Existing devices advantageous for the amelioration of discharges on water of 8 floating hazardous chemicals were identified and evaluated. Sorbents that have a high potential to ameliorate discharges of 13 miscible/soluble representative hazardous chemicals were identified and evaluated. Experimental tests were performed. It was found that very few techniques have been established or tested for amelioration of discharges of hazardous chemical on water. Therefore, the identifications and evaluations of agents were based upon the known physical and chemical properties of the representative hazardous chemicals and of the applicable amelioration agents and upon recorded experience in treatment of polluted water, mill ponds, plant efflux, stream purification and oil pollution control methods. It was concluded that the use of chemical agents is feasible for 29 of the 30 representative hazardous chemicals and, by inference, to most of the CHRIS list of four hundred hazardous chemicals. The types of available agents evaluated to be most advantageous were sorbents, ion exchangers, diluents, neutralizers, collectors, precipitants, reductants, oxidizers and ultrafiltration membranes. It was further concluded that many available off-the-shelf devices with demonstrated capacity for usefulness in containing, gathering and removing oil spilled on water will also be advantageous in amelioration of discharges of floating hazardous chemicals on water. (Sinha-OEIS)
W77-08910

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
L. A. Schultz, P. C. Deslauriers, R. P. Voelker, O. M. Halstad, and D. E. Abrams.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A016 465, Price codes: A05 in paper copy, A01 in microfiche. U. S. Coast Guard Office of Research and Development Report No. CG-D-130-75, July 1975. 92 p, 5 append.

Descriptors: *Oil spills, *Mechanical equipment, Ice cover, Arctic, Equipment, Oil pollution, Oil wastes.
Identifiers: *Oil recovery devices.

Full size tests of two oil spill recovery devices, the Lockheed Clean Sweep Model R2003 and the Marco Pollution Control Class I Oil Recovery System, operating in a simulated Arctic environment incorporating below freezing temperatures and ice infested waters in given in this final report. Tests were conducted with both devices in broken fresh water ice and salt water ice, with No. 2 diesel oil and a crude oil selected to closely match the properties of Prudhoe Bay crude oil, at temperatures of +25 F and +15 F. These tests demonstrated that with minor hardware modifications

and the proper operating procedures, both devices will successfully recover crude oil and No. 2 diesel oil spilled in a broken ice field of moderate ice-piece size. The unit oil recovery rate ranged from 1 to 10 gpm per foot of device width for the Lockheed device and from 2 to 25 gpm per foot of device width for the Marco device. (Sinha - OEIS)
W77-08915

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

OCEAN DUMPING IN THE UNITED STATES - 1975, THIRD ANNUAL REPORT OF THE ENVIRONMENTAL PROTECTION AGENCY ON THE ADMINISTRATION OF TITLE I OF THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT OF 1972, AS AMENDED.
Environmental Protection Agency, Washington, D. C. Office of Water and Hazardous Materials.
For primary bibliographic entry see Field 5B.
W77-08919

PHYSICAL AND CHEMICAL PARAMETERS ASSOCIATED WITH PHYTOPLANKTON ABUNDANCE AND PERIODICITY IN A FERTILIZED FISH POND,
Auburn University, Auburn, Alabama, Dept. of Fisheries and Allied Aquacultures.
For primary bibliographic entry see Field 5C.
W77-08922

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst, Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W77-08924

COMPUTER MODELING FOR THE PREDICTION OF WATER QUALITY FROM AGRICULTURAL DRAINAGE,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08934

SECTION 208 AND SECTION 303 WATER QUALITY PLANNING AND MANAGEMENT: WHERE IS IT NOW,
National Resource Defense Council, Washington, D.C.
D. L. Donley, and K. L. Hall.
Environmental Law Reporter, Vol. 6, p 50115-20, 1976.

Descriptors: *Federal Water Pollution Control Act, *Administrative agencies, *Comprehensive planning, *Water quality control, Governmental interrelations, Planning, Management, Legislation, Legal aspects, Regulation, Standards, Water quality, Water quality standards, Discharge(Water), Runoff, Degradation(Stream), Water pollution, Water pollution sources.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Environmental policy, Point sources(Pollution), Administrative regulations, National Pollutant Discharge Elimination System, Non-point sources(Pollution), Best management practices.

The Environmental Protection Agency (EPA) has substantially revised the regulation outlining the elements of water quality planning and management required by sections 208 and 303. The revised regulations call for a continuing planning process with provisions for periodic review and revision. Requirements for reformation of state antidegradation has also been added. Section 208, which addresses water quality problems from nonpoint sources, is being approached by requiring development and implementation of Best Management Practices (BMP). An appropriate BMP strategy would include proposed regulatory plans, management agencies, and projected costs. The water quality standard revisions pertaining to Section 303 have weakened the strong commitment to upgrading water quality standards to meet the 1983 goal. States may now downgrade existing water quality standards based on the concept of attainability which takes into account environmental, technological, social, economic, and institutional factors. However, the new antidegradation policy, if properly implemented, will protect high quality water from pollution and will curb current pollution. Only after public participation can a state qualify this regulation to allow for lower water quality. Public involvement is also seen to play a major role in both the planning and implementation stages of sections 208 and 303. (Petruff-Florida)
W77-08949

MANY CHANGES URGED FOR PL 92-500,
C. W. Heckroth.
Water and Wastes Engineering, Vol 13, No 3, p 34-39, March 1976.

Descriptors: *Federal Water Pollution Control Act, *Water Pollution Control Federation, *Governmental interrelations, *Administrative agencies, Administration, Government finance, Grants, Legal aspects, Water quality standards, Water law, Research priorities, Planning, Training, Effluents, Discharge(Water), Disposal, Oceans, Waste water(Pollution), Pre-treatment(Water).
Identifiers: *National Commission on Water Quality, *Federal Water Pollution Control Act Amendments of 1972, *Non-point sources(Pollution), PL 92-500.

Grievances against PL 92-500 were recently aired before the National Commission on Water Quality (NCWQ). The Water Pollution Control Federation (WPCF) recommended: (1) achieving the goals of the construction grants program through a federal funding commitment for the construction of municipal wastewater treatment facilities; (2) reconsidering the level of long-term federal funding; (3) making funding available on a cost effective basis; (4) emphasizing research to improve plant design and operation; (5) expanding existing training programs; (6) eliminating federal and state duplication in the area of grant applications; (7) delegating more responsibility to the states; (8) defining secondary treatment in more flexible terms; (9) allowing flexibility with respect to section 204b(1) requirements; (10) deleting the industrial cost requirement; (11)extending the 1977 deadline where necessary; (12) building a data basis for assessing nonpoint pollution sources. Another proposal was doing away with the zero discharge requirement, and allowing more flexibility in effluent guidelines by giving consideration to such variables as raw water quality and differences in geologic functions of source streams. The continuation of ocean disposal in the U. S. was also urged. (Petruff-Florida)
W77-08950

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
R. B. Pojasek.
Environmental Science and Technology, Vol 9, No 4, p 320-24 (April 1975). 1 photo, 1 tab.

Descriptors: *Monitoring, *Measurement, *Regulation, *Water analysis, Permits, Control, Data collections, Legal aspects, Administrative agencies, Water pollution control, Water pollution sources, Federal Water Pollution Control Act, Testing procedures, Methodology, Chemical analysis, Sampling, Laboratory tests, Pollutants.
Identifiers: *National Pollutant Discharge Elimination Permits, Variance.

A substantial monitoring program may be necessary to provide required information to be included in mandatory Federal Water Pollution Control Act (FWPCA) permits for individuals discharging pollutants into a waterway from a point source. One of the most important considerations in the permit-granting process is the analytical methodology employed by the permit applicant. Guidelines which establish test procedures for the analysis of pollutants must be compiled with unless a variance is granted. Confusion exists regarding interpretation of these guidelines. It is unclear whether the standard methods must always be used or whether alternative methods are acceptable. The actual selection of a test procedure varies with the application, the precision and accuracy necessary, and an evaluation of cost and available manpower. Good chemical judgment should always be the primary consideration. The only way for the competent environmental chemist to select a method not included on the guideline list, is by following an established procedure, which is described in detail. The author suggests that the Environmental Protection Agency consider revising the variance procedures. (Rieck-Florida)
W77-08953

COMPLYING WITH DISCHARGE REGULATIONS,
Environmental Protection Agency, Washington, D. C. Office of Water Enforcement.
C. J. Schafer, and N. Lailas.
Environmental Science and Technology, Vol 8, No 10, p 903-06 (October 1974). 2 chart.

Descriptors: *Effluents, *Pollutant identification, *Permits, *Industrial wastes, Municipal wastes, Pollutants, Pollution abatement, Regulation, Monitoring, Measurement, Data collections, Navigable waters, Water quality, Water quality, Water quality control, Waste water treatment, Water pollution.
Identifiers: *Effluent limitations, *National Pollution Discharge Elimination System, Federal Water Pollution Control Act Amendments of 1972, Point sources(Pollution), Effluent guidelines.

Under the National Pollutant Discharge Elimination System (NPDES), industrial, municipal and other point source discharges must obtain permits setting forth specific limitations on the discharge of pollutants into the navigable waters of the United States. The Federal Water Pollution Control Act (FWPCA) Amendments delegated the task of publishing regulations providing 'guidelines' for uniform effluent limitations from point sources to the Environmental Protection Agency (EPA) Administrator. The regulations give meaning to the terms 'best practicable' and 'best available' when applied to various categories of industries. The guidelines also establish 'effluent limitations' to be imposed on classes and categories of dischargers. Finally, these regulations identify control measures and practices to eliminate discharge of pollutants. The self-monitoring requirements contained in the permit are developed on an individual basis, with consideration given to the type of treatment, the impact of the proposed treatment facilities on the receiving waters, and the parameters to be measured. In the case of a noncomplying discharge, the permittee must take reasonable steps to minimize adverse impact on navigable waters, while increasing monitoring if necessary. (Rieck-Florida)
W77-08954

EFFLUENT LIMITATIONS AND NPDES: FEDERAL AND STATE IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Epstein, Salloway, and Kaplan, Boston, Mass.
T. B. Arnold.
Boston College Industrial and Commercial Law Review, Vol 15, No 4, p 767-93.

Descriptors: *Federal Water Pollution Control Act, *Effluents, *Permits, Water pollution, Legislation, Regulation, Governments, Federal government, State governments, Administrative agencies, Industrial wastes, Water pollution sources, Water quality, Pollution abatement, Water law, Legal aspects, Control systems, Penalties(Legal), Standards, Water quality standards, Governmental interrelations, State jurisdiction.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Point sources(Pollution), *National Pollutant Discharge Elimination System, National Environmental Policy Act, Effluent limitations, Refuse Act of 1899, Congressional hearings, Administrative regulations.

In 1971 Congress surveyed the continuing environmental and economic damage caused by water pollution in the United States, and concluded that the national effort to abate and control water pollution water ineffective. To rectify the situation two major changes were made in the existing law. First, the primary control mechanism was changed from water quality standards to effluent limitations on each point source. Secondly, a national permit system was established to control the discharge of pollutants by each point source. The changes were incorporated in the Federal Water Pollution Control Act Amendments of 1972 (FWPCA). Ambiguities in the language of the FWPCA have diminished its effectiveness. For example, in setting effluent limitations Congress required the 'best practicable control technology currently available'. What factors should determine what is the best practicable control technology. Should there be a single industry standard or should each point source be evaluated separately. Congress conferred the authority to regulate the permit system on the states, or in lieu of state action, upon the Environmental Protection Agency (EPA). However, failure to specify whether states must adopt federal regulations as state law has resulted in lack of uniformity in state administration and enforcement of the FWPCA. (Moorhouse-Florida)
W77-08956

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WIT" ALL THEIR SKILL...'
J. W. Hodges.
San Diego Law Review, Vol 11, No 3, p 757-774 (May 1974).

Descriptors: *Radioactive wastes, *International law, *Pollution abatement, *Radioactive waste disposal, Nuclear wastes, Law of the sea, Wastes, Water pollution sources, Waste treatment, Legal aspects, International waters, Water pollution, Disposal, Oceans, Pollutants.
Identifiers: *1972 Ocean Dumping Convention, Radioactive pollution.

The 1972 Ocean Dumping Convention regulates the dumping of all radioactive wastes and materials belonging to ratifying nations. However, nonsignatory nations are not affected by the convention's restrictions. Although the Dumping Convention is a major step toward controlling such pollution, the international law of marine pollution is still a major method of protection. There are four basis for the legal prevention of nuclear pollution of the oceans resulting from the disposal of radioactive waste products. These four principles appear to be exceptionally well suited to nuclear pollution problems. The Freedoms of the Seas principle may reasonably provided a foundation for international law restricting radioactive marine pollution. The right of self protection and the right of self defense may also prove to be viable tools to prevent nuclear dumping. A third concept in international law which lends inself to control of nuclear pollution is the 'Effect Principle' set forth in the Second Restatement of the Foreign Relations Law of the United States. The final, and perhaps most challenging principle may be the protection of certain general interests, or, 'offenses against the Law of Nations'. (Rieck-Florida)
W77-08957

A CONSULTANT'S VIEW OF PL 92-500.
Water and Sewage Works, Vol 122, No 3, p 68-71 (March 1975).

Descriptors: *Engineering, Personnel, *Environmental engineering, *Water pollution control, *Social aspects, *Environmental effects, Financial feasibility, Administration, Administrative decisions, Planning, Decision making, Governments, Project planning, Legislation, Industrial wastes, Water quality, Waste water treatment, Municipal wastes, Treatment facilities, State governments, State jurisdiction, Regions, Regional development, Discharge coefficient, Federal Water Pollution Control Act.
Identifiers: PL 92-500, Federal Water Pollution Control Act Amendments of 1972.

The article presents the view of one consulting engineer of PL 92-500, and of the role of a consultant in the pollution battle. The engineer interviewed, Paul Haney of Block and Veatch, felt that the basic philosophy behind PL 92-500 is good, although the act itself is not. He believed that the act undermined states' rights, and failed to meet public expectations in the clean water cause. He felt the funding must be more stable while the burden of bureaucratic red tape be reduced. The consultant favored deletion of the industrial cost recovery requirement since it actually discourages the formation of regional systems to combine the treatment of industrial and municipal wastes. In his opinion other flaws in the Act are the unrealistic time tables for obtaining permits, the overemphasis on planning, and the impossible goal of zero discharge. The role of the engineering consultant is expanding to encompass environmental, financial, and social aspects of water pollution control. The new regulations' emphasis on cost effectiveness encourages the consultants to be innovative in designing treatment plants. (Rieck-Florida)
W77-08958

PL 92-500: A DOSE OF CHAOS,
Water Pollution Control Federation, Washington, D. C.
J. D. Parkhurst.
Water and Sewage Works, Vol 121, No 9, p cover, 4 (September 1974). 1 photo.

Descriptors: *Pollution abatement, *Water Pollution Control Federation, *Federal Water Pollution Control Act, *Water quality standards, Legislation, Legal aspects, Water pollution, Water quality, Administration, Regulation, Administrative decisions, Water pollution control, Economics, Economic feasibility, Federal government, Costs, Cost sharing.
Identifiers: Environmental policy, Administrative regulations.

The Water Pollution Control Federation workshop comments that the Federal Water Pollution Control Act (FWPCA) is inflexible and cumbersome primarily because it fails to consider local circumstances and constraints. The consensus of member associations criticized the Act's lack of adequate federal funding, unrealistic deadlines and goals, administrative confusion caused by changing guidelines and regulations, the lack of technically competent high-level administrators, and the proliferation of paperwork and red tape. The Water Pollution Control Federation is currently preparing recommendations for proposed amendments to provide for flexibility for the exercise of professional judgment, integrity and fiscal sanity in the FWPCA and its administration. It is imperative that red tape and excessive costs be eliminated if orderly progress is to be achieved toward preservation and enhancement of water quality. (Rieck-Florida)
W77-08959

WHEN YOU THINK ABOUT POLLUTED WATERS, THINK ABOUT YOUR STREAMS AND RIVERS.
The Florida Naturalist, Vol 48, No 4, p 6-11 (1975). 6 photo.

Descriptors: *Federal Water Pollution Control Act, *Pollution abatement, *Water pollution control, *Industrial wastes, *Municipal wastes, Agricultural runoff, Clearcutting, Strip mining, Legal aspects, Regulation, Administrative agencies, Governments, Forest management, Agricultural chemicals, Urban runoff, Pollutants, Streams, Rivers, Abatement, Control.
Identifiers: *Federal Pollution Control Act Amendments of 1972, *Point sources(Poltlution), Non-point sources(Pollution).

Outlined here are steps that concerned citizens can take to insure that the 1972 Amendment to the Water Pollution Control Act work to clean the nation's polluted watercourses. Goals and definitions are provided to aid in understanding the pollution process. Available controls for pollution from industrial and municipal point sources are listed. Remedies for pollution from nonpoint sources such as agriculture, construction sites, logging, mining and urban areas are also discussed. In addition, the steps for water pollution control strategy in Section 208 of the 1972 Water Act are explained. Citizens are urged to pressure local, state and federal water pollution control agencies to carry out federal water quality law. Various routes of citizen action are suggested in demanding that the law be rigorously developed and enforced to clean the nations's rivers and streams. (Rieck-Florida)
W77-08960

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
C. E. B. McKenry.
Sea Grant Special Report No. 6, April 1976. 23 p.

Descriptors: *Bays, *Water utilization, *Water quality, *Preservation, Water management(Applied), Regulation, Legislation, Water policy, Population, Water sports, Economic impact, Permits, Construction, Fishing, Biota, Water pollution, Waste disposal, Marinas, Boating regulations, *Florida.
Identifiers: *Biscayne Bay(Fla), Symposium, Aquatic preserve area.

Legislative concern about the deterioration of Biscayne Bay culminated in a 1974 law designating the Bay as an aquatic preserve. Before any further action can be taken, the public consensus must be assessed. The first Symposium on Biscayne Bay raised several technical issues which Symposium II addressed. The analysis and discussion of the Bay was divided into three major areas: (1) Environmental quality; (2) Utilization; and (3) Bay management. In considering the Environmental quality aspect, it was noted that water quality is the key to the restoration and preservation of a healthy bay. Specific recommendations include: (1) regulation and control of boat discharges into the Bay; (2) encouragement of the county for rules which are more restrictive than State or Federal rules; (3) strict enforcement of regulations on runoff of fertilizers and pesticides; (4) greater care and maintenance of the Bay to be used for both sports and commercial fishing activities. Several recommendations were made on induced mangrove growth in the area. Recommendations made in the Bay utilization area include: (1) regulation for safety and use designation when activities increase in the future; (2) additional public access to the Bay; (3) maintenance and enforcement of appropriate zoning standards. In regard to Bay management, the report urged the creation of a unified Biscayne Bay Authority to coordinate research, create a master plan, control pollution and disseminate information. (Martin-Florida)
W77-08961

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON GLOBAL WATER LAW SYSTEMS, SEPTEMBER 1-9, 1975, VALENCIA, SPAIN.
For primary bibliographic entry see Field 6E.
W77-08966

CHANGES URGED AT NCWQ HEARINGS,
For primary bibliographic entry see Field 6E.
W77-08967

WHAT 208 PLANNING CAN DO: A LOCAL AND FEDERAL VIEW,
For primary bibliographic entry see Field 6E.
W77-08968

SAY GOODBYE TO OCEAN DUMPING,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 3, p 426-28 (March 1976).

Descriptors: *Alternative costs, *Oceans, *Water quality, *Water pollution control, Disposal, Waste disposal, Municipal wastes, Alternative planning, Incineration, Landfills, Land reclamation, Drying, Soil contamination.
Identifiers: Cropland application, Recalcination, Compost, Metals extraction.

A recent Environmental Protection Agency (EPA) decision involving the disposal of sludge makes the disposal, or use, of sludge a significant issue. The theoretical alternatives include incineration, landfilling, cropland application, land reclamation, recalcination of lime-based sludges, drying and marketing, composting, metals extraction, and the synthesis of useful projects. However, practical limitations eliminate many of these possibilities at the outset. An individual analysis of each possibility included such problems as air pollution, sanitation, lack of access to large tracts of land, pretreatment requirements, water contamination from runoff, and immense capital costs. The abandonment of ocean dumping as a sluge disposal alternative involves real economic sacrifice. Cost data on various disposal alternatives generally reveal that ocean disposal is the cheapest alternative available. This is demonstrated by the table provided, which offers a cost comparison of seven sludge disposal options. The conclusion of rather extensive analysis was that all forms of sea disposal are appreciably more economical than any form of land disposal studied. (Rieck-Florida)
W77-08969

EPA PROPOSES UNTIMELY AMENDMENTS,
A. S. Heid.
Journal Water Pollution Control Federation, Vol 48, No 3, p 424-26 (March 1976).

Descriptors: *Treatment facilities, *Water quality standards, *Economics, *Federal budget, Legislation, Construction, Cities, Facilities, Budgeting, Economic justification, Construction costs, Water pollution, Water quality, Economic feasibility, Grants, Financing, Government finance.

As a result of pressure from the Office of Management and Budget, in an effort to bring spending within budget capacities, Russell Train, head of the Environmental Protection Agency (EPA), has proposed several amendments to the Federal Water Pollution Control Act (FWPCA) Amendments of 1972. These amendments concern the construction grants program for municipal facilities. The first amendment would provide that the federal share of construction grants for certain categories of treatment works could be reduced to less than 75 percent for projects authorized after fiscal year 1976. The next proposed amendment provides limitations on the amount of reserve capacity for treatment plants that is eligible for federal assistance. The third amendment proposes that federal funding would be provided only up to levels necessary to bring projects into compliance with federal effluent limitations based on secondary treatment or best practicable waste treatment technology. The last amendment would amend Section 301 of the FWPCA, and proposes that the current deadline be extended on a case-by-case basis up to Jly 1, 1983, so that publicly owned treatment works would comply with secondary treatment and water quality requirements. (Rieck-Florida)
W77-08970

ENFORCEMENT OF MUNICIPAL PERMITS: PORTENT OF PROBLEMS,
For primary bibliographic entry see Field 6E.
W77-08971

PL 92-500: NEW FEDERALISM OR FEDERAL TAKEOVER,
For primary bibliographic entry see Field 6E.
W77-08972

SPILL PENALTIES DRAW CRITICISM,
For primary bibliographic entry see Field 6E.
W77-08973

RECENT DEVELOPMENT, ENVIRONMENTAL LAW--WATER POLLUTION.
Indiana Law Review, Vol 9, No 3, p 702-10 (1976).

Descriptors: *Illinois, *Indiana, *Interstate rivers, *Interstate, Federal government, State governments, Political aspects, Legal aspects, Water policy, Bodies of water, Lakes, Great Lakes, Lake Michigan, Great Lakes Region, Industrial wastes, Effluents, Industrial water, Social aspects, Water pollution, Water pollution control.
Identifiers: *Inland Steel Company, *Federal Water Pollution Control Act, Nuisance(Legal aspects).

The defendant, Inland Steel Company, was found guilty of interstate water pollution and fined $1,905,000 by a Cook County (Illinois) Circuit Court. Inland Steel is a Chicago-based company operating in Indiana. A short time prior to the filing of the suit, the federal Environmental Protection Agency (EPA) has approved Inland's current and proposed pollution control programs. Additionally, the discharge operations were in conformity with Indiana water quality standards. Defendant objected to the Illinois court's election to apply the Illinois water quality standard rather than either the Indiana statute or the Federal Water Pollution Control Act (FWPCA). The Illinois court rejected the Inland Steel plea, and ruled that a corporation operating outside the forum state is liable to the state in which the trial court sits under the forum state's standards for the pollution of interstate waters. The court reasoned that the Federal Government had not preempted the field of water pollution control, and states could therefore apply their own standards. Additionally, no state was at the mercy of a neighbor state whose water quality standards were less stringent. Hence, although Inland Steel may have been in conformity with both Federal and Indiana law, they were liable under the more stringent Illinois statute. (Moorhouse-Florida)
W77-08975

WETLANDS PROTECTION UNDER THE CORPS OF ENGINEER'S NEW DREDGE AND FILL JURISDICTION,
D. Ratliff.
Hastings Lw Journal, Vol 28, No 1, p 223-45, September, 1976.

Descriptors: *Dredging, *Tidal marshes, *Wetlands, *Protection, Headwaters, Rivers, Streams, Coasts, Navigable waters, Marshes, Bodies of water, Jurisdiction, Legislation, State jurisdiction, Federal jurisdiction, Administrative agencies, Regulations, Legal aspects, Water policy, Permits, Inland waterways, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Coastal wetlands, Fill permits, Administrative regulations.

The delicately balanced marsh ecosystem of the tidal wetlands is extremely vulnerable to the enterprises of modern man. Dredge and fill activities have done disastrous and irrevocable damage to the tidal marsh resource. New Army Corps of Engineers regulations recognize the ecological importance of wetlands. They expand the Corp's jurisdiction under section 404 of the Federal Water Pollution Control Act (FWPCA) of 1972. This broader jurisdiction which includes coastal wetlands contiguous or adjacent to navigable waters, should enable the Corps to defend tidal marshes more effectively. Inland jurisdiction is enlarged to extend in all cases to the 'headwaters' of the river, lake or stream. The move toward joint permit processing with responsible state agencies is an attempt to end bureaucratic delay. The new regulations are, however, replete with vague terms, leaving the precise contours of the new jurisdiction to be decided by future conflict. The overly narrow definition of 'coastal wetlands' and an overly broad disclaimer clause are a few of the major problems with the regulations. These objections aside, the interim final regulations are an encouraging advance for wetlands protection. (Rieck-Florida)
W77-08977

PORTER--COLOGNE WATER QUALITY CONTROL ACT.
For primary bibliographic entry see Field 6E.
W77-08978

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
N. Tauman.
Environment Law, Vol 6, No 2, p 561-81 (1975).

Descriptors: *Groundwater, *Water quality control, *Water quality standards, *Water pollution control, *Water permits, Water pollution, Water pollution sources, Water quality, Water resources, Water law, Waste disposal, Waste disposal wells, Waste dumps, Underground streams, Soil water, Chemical wastes, Judicial decisions, Effluents.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *Effluent limitations.

The operation of the Federal Water Pollution Control Act (FWPCA) Amendments of 1972 was at issue in United States v. GAF Corporation. The federal government sought to enjoin the drilling of two deep wells for the disposal of organic chemical wastes without prior approval of the Environmental Protection Agency (EPA). The court held that disposal of chemical wastes into underground waters was not covered by the Act, and alternatively, that EPA's failures to promulgate effluent limitation standards prevented the government's prosecution. While groundwater was specifically excluded from the Act's definition of navigable water, the Act provides that the states have authority to regulate well discharges. The court further interpreted the Act to mean that until effluent limitations standards are set by EPA, pollution discharges cannot be limited; disregarding the interpretation by EPA that the failure to set effluent limitations would preclude the discharging of any wastes at all. The Act itself and legislative history clearly show that a permit is mandatory when effluent limitations have been set. Further, the author states that the court erred in asserting that there was no provision in the Act for interim permits. The Act gives the EPA Administrator power to issue permits and set conditions as he sees fit in order to carry out the provision of the Act in the absence of the necessary standards. The decision of this court gives impetus to industry for the delay in setting effluent limitations, and could

bring the enforcement power of the 1972 Amendments back to the state of the 1965 Water Quality Act which was consistently ignored by industry. (Welch-Florida)
W77-08979

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
For primary bibliographic entry see Field 6E.
W77-08981

AMEND THE MERCHANT MARINE ACT OF 1920 (HEARINGS ON S 2422 TO INCLUDE THE VIRGIN ISLANDS WITHIN THE SCOPE OF THE ACT WITH RESPECT TO TRANSPORTATION OF OIL AND OIL PRODUCTS).
For primary bibliographic entry see Field 6E.
W77-08982

TOXIC POLLUTANT EFFLUENT STANDARDS FOR ALDRIN/DIELDRIN, DDT, ENDRIN, AND TOXAPHENE,
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 42, No 8, p 2588-2617, January 12, 1977.

Descriptors: *Federal Water Pollution Control Act, *Water quality standards, *Regulation, *Toxins, *Chemicals, Chemical industry, Pollution, Standards, Administrative agencies, Aquatic life, Toxicity, Effluents, Water quality control, Public health, Environmental effects, Water pollution control.
Identifiers: Administrative regulations, Aldrin/Dieldrin, DDT(DDD DDE), Endrin, Toxaphene, Ambient water criterion, Effluent limitations.

Pursuant to §307(a) of the Federal Water Pollution Control Act (FWPCA) as amended, the Environmental Protection Agency (EPA) proposed general regulatory provisions and toxic pollutant effluent standards for four toxic substances: aldrin/dieldrin, DDT (DDD, DDE), endrin and toxaphene. Each of the proposed standards provides for maximum average daily and monthly effluent standards (or prohibitions). The standards for endrin and toxaphene also include a monthly average emission limit. In addition, each standard provides an ambient water criterion. If the effluent standards are not sufficient to achieve the ambient water criterion because of local receiving water conditions, the cognizant regulating authority may impose more stringent effluent limitations in order to achieve the required criterion. In developing the standards the EPA considered the effect of the pollutant on organisms in the waters and the effects on human health. All other federal agency comments were reviewed and considered by the EPA. It also summarized comments to the proposed regulations from other interested parties and made necessary changes in the regulations in response to those comments. (Rieck-Florida)
W77-08983

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA AND AMMONIUM NITRATE SUBCATEGORY.
Environmental Protection Agency, Washington, D. C.
Federal Register, Vol 41, No 138, p 29429-32, July 16, 1976.

Descriptors: *Ureas, *Fertilizers, *Ammonium compounds, *Nitrogen compounds, Ammonia, Nitrogen, Regulation, Water pollution sources, Wastes, Water quality, Water law, Water pollution, Legal aspects, Agricultural chemicals, Pollution abatement, Water quality standards, Federal government, Industrial wastes, Water pollution control.
Identifiers: *Effluent limitations, *Administrative regulations, Point source pollution control.

The Environmental Protection Agency (EPA) has proposed to amend the effluent guidelines for urea and ammonium nitrate manufacture in the face of industry charges that inadequate data bases were used in prior determinations. The EPA received data from over 70% of all such manufacturers in response to its latest request. The urea subcategory was divided into plants making solutions only and those producing prilled or granulated urea. The underlying assumption that the additional process of prilling would increase discharges slightly was supported by data from urea manufacturers. However, plants producing prilled ammonium nitrate had equal and even lower discharges than those producing ammonium nitrate solutions. Therefore all forms of ammonium nitrate were combined in establishing the new regulations. Standards based on application of the best practicable control technology currently available and the best available technology economically achievable are presented for both the urea and ammonium nitrate subcategories. Numerous tables are included to illustrate the data used and the new standards. (Moorhouse-Florida)
W77-08984

INTERIM PRIMARY DRINKING WATER REGULATIONS: PROMULGATION OF REGULATIONS ON RADIONUCLIDES.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 133, p 28402-409, July 9, 1976.

Descriptors: *Potable water, *Public health, *Radioisotopes, *Radium radioisotopes, Radioactivity effects, Radiation, Uranium radioisotopes, Water quality, Domestic water, Water pollution sources, Legal aspects, Water law, Water properties, Water pollution, Social aspects, Safety, Regulation.
Identifiers: *Administrative regulations, Radionuclide, Public Health Service Act, Public health service, Health hazards.

The regulations for radioactivity in drinking water promulgated pursuant to the Public Health Service Act are presented by the Environmental Protection Agency (EPA) herein in final form. Estimates reveal that approximately 500 community water systems would exceed the maximum contaminant level for radium of 5 pCi. Furthmore, screening measurements of gross alpha particle activity are permitted for all public water systems that exceed 2 pCi per liter in lieu of radium analysis. 5 pCi/liter was retained as the maximum contaminant level for radium despite requests for a higher limit for small public water systems. Evidence provided by the U.S. Public Health Service indicated that any higher level of contamination presented serious health hazards. In addition, numerous technical changes were made in the proposed regulations to add clarity and delete obsolete methods. For example, a new detection limit of 4 pCi/liter has been established for gross beta particle activity so that gross beta analysis may serve as a substitute radiation measure in some cases. The regulations will become effective in their entirety June 24, 1977. Several tables are used to illustrate the parameters established, substantive technical data is incorporated in the document, and appendices consisting of comments and suggestion received by the EPA in the course of this study are included. (Moorhouse-Florida)
W77-08985

EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
Federal Register, Vol 41, No 61, p 12990-13004 March 29, 1976.

Descriptors: *Effluents, *Iron, *Steel, *Regulation, *Administrative agencies, Iron compounds, Federal government, Water pollution, Water pollution sources, Industrial wastes, Liquid wastes, Discharge(Water), Technology, Industrial plants, Industrial production, Industrial water, Economic impact, Industries, Operations, Regional economics.
Identifiers: *Effluent limitations, *Iron and Steel Manufacturing Point Source Category, Subcategories, Effluent guidelines and standards, Administrative regulations.

The Environmental Protection Agency (EPA) promulgated effluent limitations and guidelines for the steel and iron manufacturing industries in 1974. 1976 amendments to the regulations set new limits for various subcategories of the iron and steel manufacturing process. Standards for new sources are also included in these regulations. The principal basis for defining subcategories to which the effluent limitations apply are the inherent manufacturing or production processes associated with several steel products. Plant size and age are not viable factors for subcategorization as previous studies have shown no discernible relationship between these factors and raw waste loads, effluent quality or effluent treatability. Examination of the raw waste characteristics, process water application rates, discharge rates and effluent quality has made land location a non-viable characteristics for subcategorization. The EPA recognizes that the economic impact of the point source regulations would be detrimental to communities mainly of iron and steel works. Some latitude has therefore been granted in the issuance of permits, but such iron and steel works are expected to install new technology at an economically feasible pace. (Moorhouse-Florida)
W77-08986

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
Federal Register, Vol 41, No 59, p 12628-34, March 25, 1976.

Descriptors: *Coast Guard regulations, *Oil spills, *Penalties(Legal), *Administrative agencies, Federal government, Regulation, Legal aspects, Oil industry, Administrative decisions, Decision making, Water pollution sources, Disasters, Oil wastes, Chemical wastes, Oil pollution, Offshore platforms, Coastal structures, Law enforcement, Legal review, Judicial decisions, Costs.
Identifiers: *Administrative regulations, Hazardous substances.

The Department of Transportation has promulgated rules concerning notification to the Coast Guard of the discharge of oil or hazardous substances, the removal of a discharge of oil, and the costs or reimbursements that may be imposed or recovered for the removal of a discharge of oil or hazardous substances. Each district commander of the Coast Guard is delegated authority to assess a fine against a vessel or an onshore or off-shore facility owner who illegally discharges proscribed substances. In the event of a discharge, notification must be made to the Coast Guard National Response Center, or to the Cammander of the Coast Guard District in which the discharge occurs. Any person failing to make proper notification is subject to a fine and imprisonment. The removal of discharged oil must be made with mechanical methods and sorbents that most effectively expedite removal and minimize secondary pollution from removal operations. Chemical agents utilized for removal must be in accordance with the National Contingency Plan. Payments to the pollution fund will be required for the use of personnel and equipment necessary to remedy an oil discharge. (Moorhouse-Florida)
W77-08987

PERMIT PROGRAM REGULATIONS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D. C.
Federal Register Vol 41, No 54 p 11458-61, March 18, 1976.

Descriptors: *Permits, *Feed lots, *Farm wastes, *Regulation, Federal Water Pollution Control Act, Cattle, Confinement pens, Feeds, Livestock, Federal government, Administrative agencies, Legal aspects, Water pollution, Control, Water pollution sources, Water pollution control, Legislation, Wastes, Inspection, Poultry.
Identifiers: *Administrative regulations, *National Pollutant Discharge Elimination System(NPDES), Certification.

The Environmental Protection Agency (EPA) has promulgated regulations for applying the National Pollutant Discharge Elimination System (NPDES) permit program to concentrated animal feeding operations. Under the program permits are required for feeding operations with 1,000 or more animals for all feedlots with discharges of pollutants. For those feedlots with less than 1,000 but more than 300, permits will be required only for those operations which discharge pollutants through a man-made conveyance or directly into navigable waters which pass through the confined area. For feedlots with less than 300 animals, the general rule is to require no permit, but one may be required on a case by case basis. The EPA has summarized the comments made by members of the feeding operations industry and has responded thereto. The EPA has emphasized that the feedlot regulations were issued in response to a court order in Natural Resources Defense Council v. Train. The EPA has taken an appeal of this case, and therefore the final status of the promulgated regulations is as yet unknown. (Moorhouse-Florida)
W77-08988

GROUND-WATER USE ACT (REGULATION OF GROUND WATER RESOURCES THRU A PERMIT SYSTEM).
For primary bibliographic entry see Field 6E.
W77-08999

MIANUS RIVER PRESERVATION COMMITTEE V. ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION OF FEDERAL APPEALS COURT FOR PERMITS ISSUED BY STATE AGENCY UNDER NPDES).
For primary bibliographic entry see Field 6E.
W77-09001

COMMONWEALTH OF MASSACHUSETTS V. UNITED STATES VETERAN'S ADMINISTRATION (NOTICE OF SUIT PROVISIONS OF THE FWPCA; FEDERAL COMMON LAW NUISANCE ACTIONS).
For primary bibliographic entry see Field 6E.
W77-09002

MODINE MANUFACTURING CO V POLLUTION CONTROL BOARD OF ILLINOIS (STREAM RECLASSIFICATION AND EFFLUENT VARIANCES REQUIRED BY NEW WASTE TREATMENT TECHNOLOGY),
For primary bibliographic entry see Field 6E.
W77-09007

EFFECT OF TEMPERATURE AND HYDROXY ALUMINUM INTERLAYERS ON THE ADSORPTION OF TRACE RADIOACTIVE CESIUM BY SEDIMENTS NEAR WATER-COOLED NUCLEAR REACTORS,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Soils and Water.
For primary bibliographic entry see Field 5B.
W77-09024

HYPEROXYGEN CONCENTRATIONS IN THE HYPOLIMNION PRODUCED BY INJECTION OF LIQUID OXYGEN,
Limnological Associates, Ojai, Calif.
A. W. Fast, W. J. Overholtz, and R. A. Tubb.
Water Resources Research, Vol 13, No 2, p 474-476, April 1977. 3 fig, 13 ref.

Descriptors: *Dissolved oxygen, *Oxygenation, *Ponds, *Supersaturation, On-site investigations, Hypolimnion, Oxygen demand, Temperature, Pressure, Lakes, Limnology, *Ohio.
Identifiers: *Liquid oxygen, Liquid-oxygen injection, Oxygen concentrations.

The hypolimnion of a quarry pond at Ottoville, Ohio, was oxygenated during the summers of 1973 and 1974. The highest hypolimnetic oxygen concentrations attained were 8.0 mg/l in 1973 and 21.5 mg/l in 1974; thermal stratification was maintained both years. The 21.5 mg/l oxygen concentration is the highest value yet reported for a hypolimnion and constitutes an upper limit controlled by pressure, temperature, and oxygen demand. Degassing was observed as the high value was reached. Hypolimnion concentrations (of N2) were calculated for different injected mixtures of O2 and N2 gases. (Sims-ISWS)
W77-09028

WETTABILITY OF COAL-MINE SPOILS IN NORTHWESTERN NEW MEXICO,
New Mexico State Univ., University Park. Dept. of Agronomy.
S. Miyamoto, A. Bristol, and W. L. Gould.
Soil Science, Vol 123, No 4, p 258-263, 1977. 1 fig, 5 tab, 8 ref.

Descriptors: *Wettability, *Spoil banks, *Mine wastes, *Land reclamation, *Strip mine wastes, *New Mexico, Analytical techniques, Wetting, Strip mines, Vegetation establishment, Coal mines, Waste dumps, Reclamation, Infiltration, Mining, Physical properties.
Identifiers: *Water infiltration rates, *Infiltration tests, Fruitland formation, Water drop penetration, Capillary rise, Sodicity.

The wettability of coal mine spoils in the Fruitland formation of north-western New Mexico was studied for its effect on water infiltration. Water drop penetration and capillary rise tests were used to evaluate wettability of graded spoils, crushed overburden, and coal samples. Laboratory infiltration tests were used for verification. Results indicate: (1) spoils composed of coal fragments are poorly wettable or water-repellent; (2) organic matter in coal, especially in shiny high-grade coal, is a probable source of poor wettability; and (3) poor wettability reduces water infiltration into coaly spoils. Sodicity and spoil textures also play significant roles governing infiltration into spoils of this formation. (Henley-ISWS)
W77-09041

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
For primary bibliographic entry see Field 5B.
W77-09046

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
J. H. Cumberland, and H. W. Herzog, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 096, Price codes: A04 in paper copy, A01 in microfiche.
University of Maryland Water Resources Research Center, Technical Report No 40, April 1977. 59 p. OWRT A-028-MD(1). 14-31-0001-5020.

Descriptors: Water resources development, *Maryland, Costs, *Chesapeake Bay, *Economics, Water pollution sources, Industrial wastes, River basins, Waste water treatment, Cost analysis, Environment, Input-output analysis, Water quality control.

An essential first step in evaluating pollution costs and environmental quality is to derive the relationships between the types and levels of economic activity as they effect the generation of residuals. Methods were developed of extending traditional input-output models to account for the generation of residuals, and to trace the flows through treatment processes and environmental media. Specific technical gross residual coefficients were derived for the output of emissions from 92 types of economic activity into the Chesapeake Bay by 15 major river basins.
W77-09051

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09055

ARTIFICIAL RECHARGE TO A FRESH-WATER-SENSITIVE BRACKISH-WATER SAND AQUIFER, NORFOLK, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09066

HYDROLOGIC CONSIDERATIONS IN DEWATERING AND REFILLING LAKE CARLTON, ORANGE AND LAKE COUNTIES, FLORIDA,
Geological Survey, Tallahassee, Fla. Water Resources Div.
W. Anderson, and G. H. Hughes.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 304, Price codes: A03 in paper copy, A01 in microfiche.
Water-Resources Investigations 76-131, February 1977. 31 p, 11 fig, 1 tab, 7 ref.

Descriptors: *Eutrophication, *Lakes, *Algal control, *Dewatering, *Florida, Pumping, Surface-groundwater relationships, Lake beds, Dry beds, Compaction, Nutrients.
Identifiers: *Lake Carlton(Fla), *Orange and Lake Counties(Fla).

Lake Carlton straddles the line between Lake and Orange Counties in central Florida. The 382-acre lake is highly eutrophic and subject to virtually perpetual algal blooms. The Florida Game and Fresh Water Fish Commission has proposed to restore the lake to a less eutrophic state by dewatering the lake long enough to allow the muck on its bottom to dry and compact. Lake Carlton would be permanently sealed off from Lake Carlton. On the assumption that the seasonal rainfall would be normal, and that the dewatering phase would begin on March 1, the predicted time required to dewater the lake at a pumping rate of 50,000 gpm (gallons per minute) is 21 days. The average rate of pumping required to maintain the lake in a dewatered condition is computed to be 2,400 gpm. If pumping is ended May 31, the predicted altitude to which the lake would recover by October 31 as a result of net natural input is 56.2 feet above sea level. Raising the lake level to 63 feet above sea level by October 31 would require that the net natural input be supplemented at an average rate of about 4,860 gpm between May 31 and October 31. (Woodard-USGS)
W77-09080

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SOLID WASTE MANAGEMENT: A TEST OF ALTERNATIVE STRATEGIES USING OPTIMIZATION TECHNIQUES,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Geography; and Rutgers - The State Univ., New Brunswick, N.J. Div. of Urban Studies.
For primary bibliographic entry see Field 5E.
W77-08723

PRACTICAL USE OF DECISION THEORY TO ASSESS UNCERTAINTIES ABOUT ACTIONS AFFECTING THE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
For primary bibliographic entry see Field 6G.
W77-08927

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08941

6B. Evaluation Process

CITIZEN PARTICIPATION IN WATER POLICY FORMATION,
Washington State Water Research Center, Pullman.
J. C. Pierce, and H. R. Doerksen.
Available from the National Technical Information Service, Springfield, VA as PB-268 800, Price codes: A04 in paper copy, A01 in microfiche. 1975, 41 p, Paper presented at annual meeting of Western Political Science Association, March 20-21, 1975, in Seattle, Washington. OWRT A-069-WASH(1).

Descriptors: *Social participation, Political aspects, Social value, *Washington, *Attitudes, *Water policy, Surveys.
Identifiers: *Public participation, Citizen participation.

Based on a survey of 1300 households in the state of Washington, of which more than 60 percent responded, this paper views one portion of the public-to-policy theme by examining the level of public participation among the public and the level of public support in the water resource policy area. Because many are concerned with making government more responsive through public involvement, the actual levels of involvement and the extent to which the public supports that involvement should be among the first issues confronted. The three decision-making locations preferred by the public were experts, groups of citizens advising, and administrators with expert advice. Least preferred were the more 'political' locations--state legislature, interest groups of decision-making locations. The most preferred ways by which the public might influence policy were citizen advisory committees, public hearings, initiative and petitions, and elections. The least preferred processes were contacting state legislators, contacting agency people contacting interest groups and politial parties. The order of priorties ranged from those in which the public has more direct formal control, to those in which the publics influence is more indirect and informal.
W77-08603

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
April 9, 1975. 4 p.

Descriptors: *Recreation, *Environmental effects, *Cost-benefit analysis, *Access routes, Transportation, Economics, Water sports, Aesthetics, Beaches, Camp sites, Fishing, Boating, Natural resources, Water pollution, Recreation demand, Recreation wastes, Recreation facilities, Social aspects, Use rates, Water quality control, Federal government, State governments, Legal aspects, Biology, Institutional constraints.
Identifiers: Recreational water resources problems, Water Resources Research Conference.

The recreational use of water resources and the current lack of available information concerning this topic are discussed. Extensive research is recommended in the following areas of recreational water resources: (1) the relationship between the available supply of outdoor recreation areas and the rate of outdoor recreation participation; (2) conflicts between recreational and non-recreational use of water resources; (3) the distinction patterns of recreationists in order to properly assess recreation potentials of a given study area; (4) the legal, institutional and economic restraints that prevent the private sector from further providing recreational opportunities; (5) the optional biological, physical, and sociological capacity of recreation resources; (6) the environmental impacts of recreational use of water resources, and (7) legal and physical problems which prevent access to existing water areas. Generally, the availability of outdoor recreations areas, facilities and programs is a significant influence upon the extent of outdoor recreation participation. More adequate knowledge about this relationship would greatly assist in planning project areas for public use. (Nursey-Florida)
W77-08711

UTILITY ANALYSIS FOR THE URBAN GROWTH INSIDE THE RECHARGE ZONES OF THE GROUNDWATER RESOURCES OF SAN ANTONIO, TEXAS,
Texas Univ. at San Antonio. Dept. of Environmental Studies.
C. S. Shih, and James W. Ingram.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 788, Price codes: A07 in paper copy, A01 in microfiche. Completion Report, April 1977. 121 p, 6 tab, 60 ref, 2 append. OWRT B-192-TEX(1). 14-31-0001-5117.

Descriptors: *Groundwater resources, Management, Groundwater recharge, *Texas, *Water pollution, *Utilities, Cities, *City planning, *Urbanization, Model studies, Decision making, Social impact.
Identifiers: *San Antonio(Tex), *Edwards aquifer, Recharge zone, *Decision utility theory, *Multiattribute utility function.

With the recent advent of multiattribute utility function development, the decision analysis imbedded with the multiattribute utility measurement has become a powerful tool for analyzing the complex problems normally faced by the water resources planners and managers. The City of San Antonio, Texas, is faced with an agonizing decision of how to protect its sole water source, the Edwards Aquifer, from the threat of pollution resulting from urban sprawl over the recharge zone of the aquifer. Recent urban growth to the north and northwest of San Antonio has intensified the concern for the protection of this pristine, high quality water resource. A decision analysis model has been structured in an effort to facilitate an objective analysis and to coordinate the judgements regarding a degree of satisfaction associated with each alternative available for the protection of San Antonio's groundwater. Multiattribute utility function was used as an integrated measure of the effectiveness for various feasible alternatives. The necessary information was polled from the local water resources decision-makers through a series of cyclic opinions surveys based on the Delphi technique. Sensitivity analysis with varying assumptions was performed on the joint probability that groundwater resources will be polluted due to potential surface developments.
W77-08713

THE MANAGEMENT OF INTERNATIONAL BOUNDARY WATERS OF CANADA AND THE UNITED STATES: A COMPARATIVE STUDY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 6E.
W77-08720

THE STRUCTURAL ANALYSIS OF ENVIRONMENTAL PERCEPTION AND COGNITION: A MULTIDIMENSIONAL SCALING APPROACH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Architecture.
T. Garling.
Environment and Behavior, Vol. 8, No. 3, p 385-415, September 1976. 4 fig, 16 tab, 43 ref.

Descriptors: *Behavior, *Psychological aspects, Analytical techniques, Model studies, *Attitudes, Motivation, Social aspects, *Social values, Evaluation, Social participation.
Identifiers: *Multidimensional scaling, Semantic differential analysis, Cluster analysis, Factor analysis, Cognitive structure.

Multidimensional scaling is used to test hypotheses about perceptual/cognitive structure, where perceptual/cognitive structure is defined as the classification and coding of the physical environment. Data were also collected by the ordinary semantic differential technique for purposes of comparing methods and results. Since the area of structural analysis is largely unknown, alternative multidimensional scaling models, including the categorical model and the dimensional models, were used for comparison purposes. The factor analysis and the metric multidimensional scaling analysis suggest a close correspondence between results. It is concluded that the different methods reveal the same underlying structure. The similarity of results from the different methods suggests that similar interpretations of the factors are appropriate. These results are compared with the findings of previous studies. The basis for the evaluative assessments measured by the semantic differential technique is revealed by multidimensional scaling and cluster analysis. These analyses reveal a categorization process to which the individual contributes his systematized knowledge about his everyday physical environment. (Nessa-NC)
W77-08722

THE HYDROGEOLOGIC REGIME OF GLACIAL-TERRAIN LAKES, WITH MANAGEMENT AND PLANNING APPLICATIONS,
Wisconsin Univ. Extension, Madison.
For primary bibliographic entry see Field 2F.
W77-08724

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
S. M. Born, W. B. Lord, F. Alston, W. Bernhagen, and J. Binando.

Inland Lakes Demonstration Project, Funded by the Upper Great Lakes Regional Commission, June, 1972. 155 p, 12 fig, 12 tab.

Descriptors: *Alternative planning, *Project planning, *Institutions, *Methodology, *Water allocation(Policy), *Wisconsin, Economic efficiency, Social aspects, Administration, Land use, Land management.
Identifiers: *Chippewa River(Wis), *Chippewa flowage(Wis), *Inland Lakes Demonstration Project, Citizen participation, Interest groups.

The report contains the factual data necessary for evaluating the environmental aspects of the Chippewa Flowage project. It also defines the nature of the controversy, develops an array of alternatives, and evaluates the monetary and non-monetary consequences of each alternative. The methodology employed involves: (1) a definition of the objectives of resources management; (2) the development of each alternative. Objectives are specific statements describing the end product of policies and programs. Objectives may be contradictory and controversial, but they should be desirable in the eyes of at least some persons or groups. The definition of objectives was based on existing objectives and uses, an evolution of interest group positions, personal interviews and contacts, and press coverage. Alternatives were evaluated by first identifying pure alternatives that maximized the attainment of a single objective. The implications of pure alternatives were evaluated, which led to the refinement of the objective statements and the development of realistic proposals. The consequences of each alternative were evaluated in the context of three factors, including a release policy for the Chippewa Reservoir, a plan for lands surrounding the Flowage, and an institutional configuration that would be responsible for implementation. (See also W77-08726 and W77-08727) (Nessa-NC)
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
Inland Lakes Demonstration Project, Funded by Upper Great Lakes Regional Commission, June, 1972.

Descriptors: *Multiple purpose projects, *Investigations, *Basic data collections, *Documentation, *Wisconsin, Permits, Environmental effects, Social aspects, Social impacts, Decision making, Water chemistry, Oxygen demand, Reservoir fisheries, Fish populations, Benthic fauna, Zooplankton, Phytoplankton, Aquatic plants.
Identifiers: *Chippewa River(Wis), *Chippewa flowage(Wis), *Inland Lakes Demonstration Project, Citizen participation, Environmental impact statement.

The appendices contain the data used in the analysis described in Chippewa Flowage Investigations Part 1: Summary Report. Although the data were developed in response to a specific controversy, the results of these studies will stand alone and be useful for resource management purposes regardless of the ultimate resolution of this controversy. This document contains nineteen appendices that cover two types of information. One subset of appendices deals with the administrative, legal, and political context of the controversy. The issues addressed include Federal Power Commission licensing procedures, the project's environmental impact statement, National Environmental Policy Act review procedures, U.S. congressional action affecting the project, a chronology of events affecting an Indian tribe on Flowage lands, and selected position statements of interest groups. A second subset of appendices contains scientific data. They discuss the physicochemical characteristics of the water, oxygen depletion during ice cover, fish populations, fisheries, Benthic invertebrates, phytoplankton, and zooplankton. Twenty-three additional appendices are contained in Chippewa Flowage Investigations--Part 3B: Appendixes. (See W77-08725 and W77-08727) (Nessa-NC)
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
Inland Lakes Demonstration Project, Funded by Upper Great Lakes Regional Commission, June, 1972.

Descriptors: *Multiple purpose projects, *Investigations, *Basic data collections, *Documentation, *Wisconsin, Aquatic plants, Bank erosion, Water pollution effects, Water level fluctuations, Ecosystems, Social aspects, Economic impact, Recreation, Permits, Land management.
Identifiers: *Chippewa River(Wis), *Inland Lakes Demonstration Project, *Chippewa flowage(Wis), *Wilderness preservation, Primitive areas.

The appendices contain the data used in the analysis described in Chippewa Flowage Investigations--Part 1: Summary Report. Although the data were developed in response to a specific controversy, the results of these studies will stand alone and be useful for resource management purposes regardless of the ultimate resolution of this controversy. This document contains twenty-four appendices covering four types of information. One subset of appendices sets forth scientific information on aquatic vegetation, shoreland erosion, downstream water quality considerations, and also includes an annotated bibliography on the effects of water level fluctuations on aquatic ecosystems. A second subset of appendices contain socioeconomic information. A county profile, an Indian tribe profile, and the projected tax impacts of alternatives are included. The third subset of appendices deals with recreation and wilderness preservation issues, including alternatives for preserving and managing national wild land values, primitive area objectives, and the study group's methods and findings. The fourth subset deals with institutional problems such as Federal Power Commission relicensing and alternative land use control mechanisms. (See W77-08725 and W77-08726) (Nessa-NC)
W77-08727

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
D. W. Smith.
Report No. IWR-64, June 1975. 429 p. OWRT B-026-ALAS(1).

Descriptors: Environmental engineering, *Recreation facilities, *Recreation wastes, *Algae, Nutrients, *Productivity, *Alaska, *Data collections, Lakes, Water pollution effects, Eutrophication.
Identifiers: *Nancy Lake area(Alas), Anchorage(Alas), *Algal production.

This document is a partial completion report and concerns a phase of the project which has been terminated. The principal objective of this study was to detail the procedures, methods, alternatives, and considerations necessary for the development of environmental management programs for Alaska water-oriented recreational areas. Major emphasis was to be placed on the Nancy Lake area near Anchorage. This report is a compilation of the data collected up to September 1, 1974. Contained are: an outline of proposed project reports, a summary of the limnological data collected, a data folder concerning lakes in the study region, a thesis conducted at Nancy Lake, 'Effects of Nutrient Addition on Algal Production and an Evaluation of a Method of Measuring Algal Production,' and a copy of IWR Report No. 63, 'Evaluation of the Trophic Types of Several Alaskan Lakes by Assessment of the Benthic Fauna.'
W77-08805

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
W.R.R.C. Publication No 52, Completion Report FY-75-5, July 1975. 132 p, 4 append. OWRT A-078-MASS(1). 14-31-0001-5021.

Descriptors: *Connecticut River, *Conferences, *Massachusetts, *Research priorities, Regional analysis, Environment, Institutions, Model studies, Water quality, Water supply, Economics, Legal aspects.
Identifiers: *Research needs.

A workshop on research needs and priorities on the Connecticut River system was conducted on April 24-25, 1975 at the University of Massachusetts. The goals were to generate multidisciplinary, inter-institutional interest in a future co-ordinated research program, and define and evaluate the priorities of needed research. The plenary session presentations included: (1) introductory remarks: a research focus on the Connecticut River; (2) future environmental needs and costs; (3) the need to establish research priorities; (4) panel discussion: the need for regional collaboration; (5) an overview of basin research priorities; (6) the Connecticut River system: research and environmental protection priorities; (7) strategies for institutional collaboration; and (8) where do we go from here. Working group activities included: (1) modeling water quality and quantity; (2) floodplain ecosystems; (3) aquatic ecosystems; (4) legal and economic issues; and (5) man/environment relations.
W77-08808

ECONOMIC EVALUATION OF IDAHO'S WATER SUPPLY,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
W. C. Bailey.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 811, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, July 1975. 96 p, 19 fig, 5 tab, 31 ref, 3 append. OWRT A-044-IDA(1). 14-31-0001-5012.

Descriptors: *Economic impact, *Water supply, *Economies of scale, *Idaho, *Evaluation, *Costs, Municipal water, Industrial water, Irrigation water, *Regression analysis, Cost analysis.
Identifiers: Snake RIver(Idaho).

This study examined the costs involved in making water available for use in Idaho. The difference between quantity of water and a supply of water was emphasized. To change a quantity of water into a supply of water requires that costs be incurred. In examining the cost for making water available for use in Idaho, the water supply industry was segmented into three categories: municipal, industrial, and irrigation. Primary and secondary sources were used in the collection of data from these three categories. Regression analysis was performed on the data to determine the relationship between total, fixed and variable cost, and water output for each category. The results of the regression analysis showed there is a reasonably high correlation, 0.70 to 0.81, between cost and output. The economic interpretation of the regression results indicated the water industry in Idaho is in Stage I and subject to economies of scale.
W77-08816

ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
N. L. Johnson, Jr.
Journal of the Irrigation and Drainage Division, Proceedings of the American Society of Civil Engineers, Vol 102, No IR3, Proceedings paper No. 12378, p 273-283, September 1976. 6 fig, 2 tab, 10 ref.

Descriptors: *Cost-benefit analysis, *Flood plain insurance, *Flood plains, *Damage, *Annual flood, Average costs, Economic feasibility.
Identifiers: *Economic analysis, House owners.

A method is presented for computation of the average annual damage due to the flooding of structures. The evaluation techniques employed may be used for any area of potential flooding when one seeks to find the benefit/cost ratio of a permanent evacuation from a flood plain area. By using the procedure, the economics of the federally subsidized flood insurance program are evaluated in addition to a permanent evacuation of residents from the flood plain area. The flood insurance is found to be a real economic bargain for the owner of the house. The benefit/cost ratio of certain land-use change plans involving the lower-lying houses is found to be 2.5. Since the benefit/cost ratio of flood insurance is unity, it is concluded that the land use change plan of these lower areas is more feasible than flood insurance. (Bell-Cornell)
W77-08856

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
W. P. Simmons, and W. R. Groseclose.
Journal of the Construction Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. C03, Proceedings paper No. 12421, p 527-534, September 1976. 6 fig, 6 ref.

Descriptors: *Water resources, *Reclamation, Arch dams, Penstocks, Concretes, Pipelines, Plastics, Construction, Spillways, Tunnels, Soil mechanics, *Benefits.
Identifiers: *Bending, Monetary savings.

A diversified research program covering engineering materials, design and construction methods, ecological and sociological factors, and electric power and energy problems is described briefly. Emphasis is then placed on specific examples of engineering research which have benefited construction of the Bureau of Reclamation's water resources-related facilites. Among these are savings of $13,000,000 at Grand Coulee Third Powerplant by determining that the penstock bellmouth entrances could be made much smaller than previous practice allowed, a $25,000,000 savings by using a three-centered arch instead of a circular arch for Auburn Dam, a $2,500,000 savings by reducing the amount of cement at Coulee Third Powerplant by using pozzolans and water-reducing agents, and as yet undetermined savings through a cooperative program with industry in proving the value of and defining working limits for reinforced plastic mortar (RPM) pipe for water distribution systems and of corrugated plastic pipe for drainage systems. (Bell-Cornell)
W77-08858

ECONOMIC ROLE OF THE WATERWAY IN WESTERN EUROPE,
Port of Strasbourg (France).
For primary bibliographic entry see Field 4A.
W77-08860

INTEGRATED EVALUATION PROGRAMS FOR FAIRFAX COUNTY, VA.,
Fairfax County Office of Comprehensive Planning, Va. Director's Office.
J. Reid.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. UP1, Proceedings paper 12332, p 137-145, August 1976. 1 tab.

Descriptors: *Land use, *Planning, *Population, *Zoning, *Evaluation, *Programs, *Virginia, Drainage, Sewers, Transportation.
Identifiers: *County planning.

The growth of Fairfax County, Virginia is examined. County planning must be an accomodation between continued residential demand and the retainment of the historic, scenic, and environmental character of the county. Fairfax County has developed a response to the problem of rapid growth through the organization of a Planning and Land-Use System (PLUS), which will be capable of generating continuously updated data, policy alternatives, flexible responsive plans, implementation programs, and an effective set of regulatory measures for the county. (Bell-Cornell)
W77-08862

WATER SUPPLY ECONOMICS,
Municipal Environmental Research Lab., Cincinnati, Ohio. Water Supply Research Div.
R. M. Clark.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. UP1, Proceedings paper 12357, p 213-224, August 1976. 5 fig, 4 tab, 11 ref.

Descriptors: *Water supply, *Regional analysis, *Costs, Cost analysis, Evaluation, Facilities, Water quality, Economies of scale, *Economics.
Identifiers: *Decentralization, Economic analysis, Economic surveys, Scale effect, Location theory.

Water supply systems are generally composed of: (1) collection works; (2) purification works, where needed; and (3) transportation and distribution systems. There is much controversy over which economic arguments can be applied to water supply; e.g., it is often said that water supply exhibits significant economies of scale, thereby justifying larger and larger systems. This may be true when considering the purification works, but it does not necessarily apply to the total treatment and distribution system. In this paper, representative cost data collected from one of a series of case studies being conducted by the EPA are presented. These data should be useful in evaluating the relative economic impact and importance of the various components in the system. A suggestion is made as to the way in which the cost of water varies throughout the distribution system. (Bell-Cornell)
W77-08863

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
IWR Research Report 76-R2, U.S. Army Corps of Engineers, Institute for Water Resources, Fort Belvoir, Virginia, November 1976. 98 p, 4 fig, 17 tab, 45 photos, 13 ref, 2 append.

Descriptors: *Water resources development, *Recreation demand, *Estimating, *Benefits, *Methodology, Supply, Demand, Recreation facilities, Research, Planning, Model studies, Equations, Systems analysis, Flood control, *California.
Identifiers: *Recreation use, *Recreation activities, *American River Parkway(Sacramento California), Use prediction, Data base, Economic value, Travel cost approach, Unit value approach, Urban-oriented recreation, Recreation use models.

This report contains the results of U.S. Army Corps of Engineers research into the supply and demand of urban-oriented nonreservoir recreation. It is an interim report on an initial phase of a comprehensive effort underway within the Corps to develop methodologies, procedures, and guidance for the estimation of recreation use and benefits for nonreservoir water resource development projects. The specific objectives of the researchers were to develop a data base on use and users of urban recreation facilities which are water related but nonreservoir projects and to prepare estimating equations which produce reasonable and supportable estimates of recreation use and demand. Presented is a methodology for estimating recreation use and benefits in planning nonreservoir water resources development. Recreation activity hour-estimating models are developed from data on the American River Parkway, Sacramento, California. A narrative-pictorial and statistical description of the recreation areas is given. Application of the models is illustrated and two approaches to estimating the economic value of a nonreservoir recreation area are demonstrated. It is concluded that the analysis models and methodology for use prediction and benefit estimation developed through the described phase of research need to be duplicated and validated in other locations to insure general applicability in recreational water resources planning. The value of recreation as an economic good can be approximated from activity estimators by using appropriate travel costs as proxy for prices paid by users or by systematically considering the criteria recommended for unit day value determination. (Bell-Cornell)
W77-08871

WATER--AN ELEMENT OF LAND-USE AND URBAN GROWTH POLICIES,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center.
W. R. Walker, and W. E. Cox.
Journal of the Urban Planning and Development Division, Proceedings of the American Society of Civil Engineers, Vol 102, No UP1, Proceedings paper 12339, p 81-94, August 1976. 11 ref.

Descriptors: *Land use, *Water resources, *Planning, Sediments, Water pollution, Water supply, Potable water.
Identifiers: *Regional planning, *Urban growth, Single-purpose planning.

This article reviews the interrelationship between land and water. What is done with our land has a significant impact on what happens to our water. Different types of systems are used to increase the goodness in quality of our drinking water. Chlorination of water supplies is mentioned concerning the problem that adding this chemical to disinfect water supplies does give rise to carcinogenic materials being present in drinking water. The causes of some of our water problems and land use problems have been brought about by single-purpose planning; moreover, planning processes have not been adequately implemented due to a lack of perception of the importance of land management by the public. In conclusion, better land and water management could be facilitated with changes in existing institutional arrangements, modifications in cost-sharing policies, better use of tax incentives, more effort devoted to public education, and the adoption of a new land ethic. (Bell-Cornell)
W77-08872

LAKE-SHORELAND MANAGEMENT PROGRAMS: SELECTED PAPERS,
Massachusetts University, Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W77-08924

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9A.
W77-08931

POLICY INNOVATION AND INSTITUTIONAL FRAGMENTATION,
Arizona Univ., Tucson. Inst. of Government Research.
For primary bibliographic entry see Field 6E.
W77-09053

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
W. Johnston, L. Jackson, and D. Hansen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 105, Price codes: A03 in paper copy, A01 in microfiche. California Water Resources Center, Davis, Report No. 40, June, 1977. 37 p, 3 tab, 10 ref. (California Water Resources Center Project UCAL-WRC-W-465). OWRT B-164-CAL(1).

Descriptors: *Land use, *Water utilization, *Alternate planning, *Alternate water use, Water resources development, Planning, Management, *California, *Economics, *Environment evaluation, *Recreation, *Administrative agencies.
Identifiers: Modoc County(Calif).

Part I: Evaluating land and water resource use options of alternative development possibilities requires knowledge of regulatory, proprietory and administrative agencies and their functions with respect to local water resources. Modoc County, California is used as a demonstration area to inventory and provide insights into the roles played by more than 70 federal; state, and local agencies as they affect water related aspects of recreational and retirement motivated subdivision developments. Twenty-eight possible functional responsibilities relevant to water resources are evaluated for each agency. Part II: Three northeastern counties in California--Siskiyou, Modoc, and Lassen--have attracted varied and extensive recreational subdivision development. The build out rate for developments, the motivation of the purchasers, and the impact of these developments on local resources are important factors in assessing and planning long run resource development and use programs. A survey of selected remote subdivisions provides the basis for evaluating these influences and provides insights into the types of problems likely to arise regarding impact on water resources resulting from such land development activity.
W77-09055

AN ENERGY ACCOUNTING EVALUATION OF SEVERAL ALTERNATIVES FOR HYDROPOWER AND GEOTHERMAL DEVELOPMENT,
Utah Water Research Lab., Logan.
J. C. Batty, J. P. Riley, W. J. Grenney, and D. A. Bell.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 188, Price codes: A03 in paper copy, A01 in microfiche. Report PRJER031-1, June 1976. 36 p, 20 fig, 14 tab, 37 ref. OWRT A-031-UTAH(1), 14-34-0001-6046.

Descriptors: *Power plants, Management, Planning, *Heat exchangers, Mineral water, *Geothermal studies, Evaluation, *Alternative water use, *Energy, Thermal power plants, Design criteria.
Identifiers: Finite resources.

Alternative management strategies for hydropower and geothermal development are myriad. The approach taken in this study is based on the notion of optimum deployment of finite resources. A legitimate question which this study has attempted to address is: Does the construction of large water management facilities, such as hydropower dams, which involve huge amounts of energy, concrete, and steel, constitute an efficient use of basic resources. An energy accounting analysis technique is proposed, and using this procedure energy resource inputs are examined and compared for specific hydropower dams and geothermal power plants. The technique, though promising, still contains certain problems, and further development is needed in order to establish a consistent and uniform methodology. The energy accounting technique indicates that construction of hydropower facilities is a relatively efficient use of basic energy resources. However, because of large evaporation losses from storage reservoirs, water consumption per unit of power produced tends to be high. An analysis subsequent to the energy accounting approach suggests that combining once-through cooling of thermal power plants with pumped storage hydropower facilities could produce large water savings per unit of generated power. Further study of this configuration is recommended. The energy accounting technique also clearly identifies the high efficiency of geothermal power plants in terms of resource deployment. A heat exchanger system design which is capable of utilizing warm and highly mineralized waters is proposed, it is recommended that the design be constructed and tested on a demonstration basis.
W77-09057

LONGITUDINAL ANALYSIS OF CHANGE IN LEVELS OF AFFILIATION AND PARTICIPATION IN VOLUNTARY FORMAL ORGANIZATIONS,
Pennsylvania State Univ., University Park. Dept. of Agricultural Economics and Rural Sociology.
R. G. Harr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 098, Price codes: A04 in paper copy, A01 in microfiche. Master of Science Thesis, June 1973. 65 p, 21 tab, 19 ref, append. OWRT A-017-PA(2), 14-31-0001-3238.

Descriptors: *Social change, *Recreational facilities, *Reservoir construction, Social impact, Social aspects, Psychological aspects, Age, Occupations, *Attitudes, *Social participation.
Identifiers: *Community leaders, *Neighborhood awareness, Affiliation, Formal voluntary organization, Sex, Level of participation, *Longitudinal analysis.

This longitudinal analysis of changes in affiliation and participation levels in formal voluntary organizations over the period of 1960-1970 utilized data from all adults in a rural central Pennsylvania community physically bisected in 1968 by the construction of a flood control reservoir. These changes were related to respondents' sex, age, and occupational status. While participation rates were high in both periods the change data did not indicate stability in either affiliation or participation; in fact, a small decline in both measures was observed. Men were found to be less stable than women. Of the < 40 age group 34 percent decreased their affiliation level while in the > 70 category 81 percent decreased. Occupational status was not related to change. The decline in both affiliation and participation levels between 1960 and 1970 could not with these data be attributed to either national or state-wide trends or to other changes set in motion by the reservoir construction. (Sink-Penn State)
W77-09058

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
C. Cooper-Ruska.
Available from the National Technical Information Service, Springfield, VA as PB-268 798, Price codes: A05 in paper copy, A01 in microfiche. MS thesis, August 1974. 81 p, 82 ref. OWRT B-061-VA(2).

Descriptors: Water policy, *Inland waterways, *Navigation, *Cost sharing, Regulation, Legal aspects, Legislation, Water law.
Identifiers: *User charges.

Policies relative to inland navigation are unique in comparison to those of non-water transport modes. Waterways are considered to be public highways and, historically, one of the advantages of water transportation has been its lower costs due, in part, to a free waterways policy of the Federal Government that is set forth in the Northwest Ordinance and the Constitution. Proposals to impose user chargers on inland navigation therefore must consider the legal basis within which a cost-sharing strategy could be implemented. User charges should foster efficiency, equity, and recovery of costs within the system. Fuel taxes, license fees based on horsepower, segment tolls, lockage fees, and congestion tolls have been recommended. Each of these mechanisms for implementing user chargers is examined to determine if it will pass the legal test of consititutionality.
W77-08604

A CASE FOR GEOTHERMAL ENERGY,
For primary bibliographic entry see Field 8C.
W77-08655

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
For primary bibliographic entry see Field 8C.
W77-08657

ECONOMIC EVALUATION OF IDAHO'S WATER SUPPLY,
Idaho Univ., Moscow. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-08816

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
For primary bibliographic entry see Field 6G.
W77-08870

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

6D. Water Demand

GROUNDWATER POLICIES NOW LEAN TOWARDS MANAGEMENT.
For primary bibliographic entry see Field 4B.
W77-08660

WATER FOR INDUSTRIAL AND AGRICULTURAL DEVELOPMENT IN ATTALA, HOLMES, HUMPHREYS, ISSAQUENA, SHARKEY, AND YAZOO COUNTIES, MISSISSIPPI,
Geological Survey, Jackson, Miss. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08748

ANALYSIS OF SUPPLY AND DEMAND OF URBAN ORIENTED NONRESERVOIR RECREATION.
Institute for Water Resources (Army), Fort Belvoir, Va.
For primary bibliographic entry see Field 6B.
W77-08871

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08942

6E. Water Law and Institutions

USER CHARGES IN INLAND NAVIGATION POLICY,
Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Urban Affairs.
For primary bibliographic entry see Field 6C.
W77-08604

CONTROL OF NON-POINT SOURCES OF WATER POLLUTION WITHIN AN ECOLOGICAL FRAMEWORK: THE CASE OF THE TRI-COUNTY REGION, MICHIGAN,
Michigan State Univ., East Lansing.
P. A. Nortey.
Ph D Thesis, 1976. 189 p.

Descriptors: *Water pollution control, *Water pollution sources, Public health, Ecosystems, Model studies, Legislation, Planning, Water quality control, Environmental control, Administration.
Identifiers: Water Pollution Control Act Amendments(1972).

A study was conducted on the control of non-point water pollution sources within an ecological framework. A second objective was the evaluation of institutions and institutional planning arrangements for pollution control under Section 208 of the 1972 amendments to the Federal Water Pollution Control Act. Four principles were derived from a conceptual ecosystems model, which involved regional considerations, environmental quality, carrying capacities and tolerances, and sound management practices. The Tri-County Region of Michigan was the study area chosen. The Tri-County Planning Commission's approach was judged to be basically sound. It was sugggested that the Commission be made coordinator of all citizen participation activities relative to water pollution. Ecosystem relationships were suggested as a basis for the identification of water pollution control strategies. A close functional relationship was recommended between the planning agency and the implementing agency. Further investigation is necessary to identify the best combination of incentives for public adoption of compatible water management practices. The Section 208 program was judged to be an effective means of solving Tri-County water pollution problems and aiding better land use and economic community growth. Continuance and improvement of the program was seen as the major challenge. (Collins-FIRL)
W77-08625

PLANASA--A NATIONAL PLAN FOR WATER SUPPLY AND SEWERAGE IN BRAZIL,
Banco Nacional da Habitacao, Rio de Janeiro (Brazil).
A. Klumb.
Journal of the American Water Works Association, Vol. 69, No. 4, p 186-187, April, 1977.

Descriptors: *Planning, *Sanitary engineering, *Water supply development, *Sewerage, Public health, Water quality, Sewage treatment, Waste disposal, Construction, Economics, Research and development, Costs, Urban areas, Rural areas, Governments, Foreign countries.
Identifiers: Brazilian National Sanitation Plan(PLANASA), Brazil.

PLANASA (Brazilian National Sanitation Plan) was developed to mobilize national resources in the quickest time possible for the economical provision of basic sanitation to all Brazilian urban areas. All federal agencies involved with social development have been directed to support the effort. The United States and the Pan American Health Organization are making technical assistance available. The plan calls for a rate structure consistent with the consumer's ability to pay and reduction of operational costs by economies of scale to create a permanent balance between revenues and expenditures. A target date of 1980 has been set for the provision of drinking water to more than 80% of the urban population and for adequate sewerage facilities in major metropolitan regions. At the same time, simpler and more basic services are to be provided for towns and villages of lesser size. Meeting these goals will require a vast improvement of water quality for three-fourths of the municipalities and the expansion and construction of sewage systems. Pooling of resources on a national and state basis will be necessary, as will the training of qualified personnel and the strengthening of sanitation authorities. Means for the development and transfer of technology for the provision of the best possible systems must be devised. The major problem of the future will be to provide an impetus for the population to connect to the systems after their completion. (Collins-FIRL)
W77-08646

THE MANAGEMENT OF INTERNATIONAL BOUNDARY WATERS OF CANADA AND THE UNITED STATES: A COMPARATIVE STUDY,
Cornell Univ., Ithaca, N.Y. Dept. of Civil and Environmental Engineering.
L. B. Dworsky.
Natural Resources Journal, Vol. 15, No. 1, p. 223-227, January 1975. 10 ref.

Descriptors: *Management, *Administration, *Institutional constraints, *Comprehensive planning, *Great Lakes, *International commissions, *International Joint Commission, Political aspects, Administration, Budgeting, Legislation, *Canada, *United States.
Identifiers: *Boundary waters(Canada-US).

The article discusses improved management of the Great Lakes in order to make it more effective and to meet current and emerging questons. The International Joint Commission (IJC) is seen as the only formal arrangement between the U.S. and Canada that is broad enough to handle this problem. The major conclusions are to strengthen the IJC, and, to establish a new treaty for the Great Lakes apart from the IJC. These suggestions provide for: (1) establishing a joint Canadian-U.S. management body for the Great Lakes having surveillance and mediation functions; (2) joint agency budget and administrative procedures; (3) power to initiate planning, surveys, investigations and research under carefully specified guidelines; (4) program responsiveness by requiring that the activities of the joint management body be subject to program and budget authorization on a regular basis; (5) facilitating joint planning on a multiple purpose basis; (6) stressing intensive regional and trans-border collaboration among state and provincial governments; (7) developing a more comprehensive and systematic approach to the management of the Great Lakes; (8) joint information collection and analysis; and (9) public reporting. It is also suggested that the boundary problems are similar to those existing between Mexico and the U.S., and that a Mexican-U.S. boundary commission be set up. (Nessa-NC)
W77-08720

NORTH CAROLINA CONFERENCE ON WATER CONSERVATION.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 3D.
W77-08820

SECTION 208 AND SECTION 303 WATER QUALITY PLANNING AND MANAGEMENT: WHERE IS IT NOW,
National Resource Defense Council, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08949

MANY CHANGES URGED FOR PL 92-500,
For primary bibliographic entry see Field 5G.
W77-08950

FLORIDA'S SOVEREIGNTY SUBMERGED LANDS: WHAT ARE THEY, WHO OWNS THEM AND WHERE IS THE BOUNDARY,
G. J. MacGrady.
Florida State University Law Review, Vol. 1, No. 4, p. 596-644, Fall 1973.

Descriptors: *Florida, *Boundary(Property), *Riparian rights, *Ownership of beds, Riparian land, Tidal waters, Accretion(Legal aspects), Avulsion, Erosion, Navigable waters, Water law, Water rights, Legislation, Common law, Riparian waters, Shores, High water mark, Real property.
Identifiers: *Submerged lands, *Public trust doctrine, Sovereignty lands.

This note discusses the history, definition, ownership, and regulation of Florida's sovereignty lands--those lands beneath navigable fresh and tidal waters--together with the problems involved in demarcating their boundaries from abutting riparian lands. The sovereignty lands are held in public trust by either the state or federal government, whereas riparian lands are usually privately owned. Since the state's shorelines are constantly shifting, it has been difficult to establish a satisfactory method of boundary determination between the sovereignty and riparian lands. The author provides a detailed discussion of the scientific aspects of tidal phenomena, which is helpful to an understanding of the relative merits of ambulatory legal boundaries as opposed to fixed boundaries. Specifically discussed is the use under federal law of the ambulatory mean high tide line as the standard for boundary determination, and whether the use of that standard is mandated under Florida law. Further attention is given to the difficulties caused by Florida's own particular topography in locating such mean high tide line and the effectiveness of judicial and legislative responses thereto. (Jones-Florida)
W77-08951

NPDES PERMITS AND WATER ANALYSES.
QLM Labs., Inc., Nyack, N. Y.
For primary bibliographic entry see Field 5G.

W77-08953

COMPLYING WITH DISCHARGE REGULATIONS,
Environmental Protection Agency, Washington, D. C. Office of Water Enforcement.
For primary bibliographic entry see Field 5G.
W77-08954

EFFLUENT LIMITATIONS AND NPDES: FEDERAL AND STATE IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972,
Epstein, Salloway, and Kaplan, Boston, Mass.
For primary bibliographic entry see Field 5G.
W77-08956

INTERNATIONAL LAW AND RADIOACTIVE POLLUTION BY OCEAN DUMPING: 'WITH ALL THEIR GENIUS AND WITH ALL THEIR SKILL...'
For primary bibliographic entry see Field 5G.
W77-08957

A CONSULTANT'S VIEW OF PL 92-500.
For primary bibliographic entry see Field 5G.
W77-08958

PL 92-500: A DOSE OF CHAOS,
Water Pollution Control Federation, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08959

WHEN YOU THINK ABOUT POLLUTED WATERS, THINK ABOUT YOUR STREAMS AND RIVERS.
For primary bibliographic entry see Field 5G.
W77-08960

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

LEGAL BATTLES ON THE CALIFORNIA COAST: A REVIEW OF THE RULES,
National Oceanic and Atmospheric Administration, Washington, D. C. Office of Sea Grant.
G. Bowden.
Coastal Zone Management Journal, Vol 2, No 3, p 273-295 (1976).

Descriptors: *California, *Legal aspects, *Planning, *Land use, *Land development, Land resources, Condemnation, Condemnation value, State governments, Judicial decisions, Property values, Regulation, Coasts, Shores, Shore protection, Land management, Management.
Identifiers: *Administrative regulations, *Coastal zone management, *California Coastal Act.

The California Coastal Act is bound to arouse heated debate and controversy. The Act contains 183 policies that are designed to enumerate priorities and define planning goals. What is not certain, however, is the coming judicial reaction to this bill. Undoubtedly there will be confrontation; the purpose of this article is to anticipate the outcome of the legislative-judicial clash. The analysis covers three areas: (1) property rights, (2) requirements of a valid regulation, and (3) evolving legal doctrines. Also presented are broad guidelines as to California's stands on each of the above. Where property rights are concerned, ever since Euclid v. Amber Realty in 1926 the state courts have allowed local governments to use a wide range of regulatory devices. California rejects the granting of inverse condemnation, preferring instead to rule that a regulation should be changed or eliminated. Finally, the doctrine of vested rights still plays a major role in determining whether a land-owner has properly relied on an existing set of ground rules. (Frank-Florida)
W77-08963

FLORIDA'S BARGE CANAL PROSPECTS FOR THE FUTURE,
Florida State Univ., Tallahassee. Dept. of Ichthyology.
For primary bibliographic entry see Field 4A.
W77-08964

CONCLUSIONS AND RECOMMENDATIONS FOR THE UNITED NATIONS WATER CONFERENCE (PRELIMINARY OUTLINE),
Food and Agriculture Organization of the United Nations, Rome (Italy); and International Association for Water Law. Executive Council.
D. A. Caponera.
In: Proceedings of the International Conference on Water Law & Administration, International Association for Water Law, February 8-14, 1976, Caracas, Venezuela; Published by the Commission for the National Water Resources Development Plan (Coplanarh), Caracas, Venezuela, p 1283-1292, 1976.

Descriptors: *Water resources development, *Technical societies, *United Nations, Conferences, Water law, Organizations, Governments, Legal aspects, Social aspects, Management, Natural resources, Ground water, Planning, Coordination, Dynamic programming, International law, Conservation, Water conservation, Education, Training, Administration.
Identifiers: *United Nations Water Conference, *Second International Conference on Water Law and Administration.

The United Nations Water Conference should, in its consideration of the world's water resources and needs, initially examine the current status and recent tendencies in water law. The most recent data shows a trend toward resource-oriented water management, and an elimination of the private water concept in favor of a public water resources regime. Using a multi-disciplinary approach to water resources law will result in viewing it as an instrument for the implementation of overall water policy. The conference should evaluate the role of planning as a tool in water resources management. The transfer to resource-oriented management calls for basin planning as the essential process in water economy. Aside from its impact on the planning process, resource-oriented water management has created a need for new legal and institutional criteria focusing on politico-administrative necessities. The general decline in water quality, demands concern for environment-oriented legislation. The lack of qualified manpower stands as a major constraint to the effective development of any water resources management program. (Moorhouse-Florida)
W77-08965

PROCEEDINGS OF THE INTERNATIONAL CONFERENCE ON GLOBAL WATER LAW SYSTEMS, SEPTEMBER 1-9, 1975, VALENCIA, SPAIN.
Proceedings of the International Conference on Global Water Law Systems, September 1-9, 1975, Valencia, Spain, 4 vol, 1451 p. Published by Colorado State University, Ft. Collins, Colorado 80523. $40.00 or $10.00 microfiche. Order from Conference Director, George E. Radosevich, Dept. of Economics.

Descriptors: *Water quality control, *Water allocation(Policy), *Water management(Applied), Water law, Economics, Administration, Social aspects, Adoption of practices, Legal aspects, Comprehensive planning, Coordination, Governments, Leadership, Planning, Political aspects, Water policy, International law, Regulation.
Identifiers: *International conference, *Global water law systems.

The International Conference on Global Water Law Systems which convened in Spain focused upon particular issues basic to analyzing and improving water laws in light of the role and function of the law and its relationship to other disciplines and sectors of socioeconomic activity. The conference was an effort designed to: (1) build upon materials assembled in past meetings and publications while attempting to establish a systematic foundation of knowledge of major water law and administration systems around the globe; (2) to develop an analytical methodology for the interface of interdisciplinary, intersectoral and intergovernmental inputs to new or improved laws and codes. Among the water law systems studied were the Spanish, French, British, Italian, Soviet, Hindu-Bali, Moslem, Latin-American, Israeli and the variations found in the United States and select Asiatic countries. Three key issues or problems identified as an impediment to water resources optimization were discussed in light of needed changes in the law: (1) allocation and reallocation of water supplies; (2) integration of water quality and quantity control; (3) management and conjunctive use of ground and surface waters. (Rieck-Florida)
W77-08966

CHANGES URGED AT NCWQ HEARINGS,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 2, p 230-33 (February 1976).

Descriptors: *Permits, *Financing, *Water pollution control, *Water Pollution Control Federation, Regulation, Federal government, Federal-state water rights conflicts, State governments, Control, Legislation, Federal jurisdiction, State jurisdiction, Legal aspects, Water quality control, Water pollution, Costs, Loans, Research and development, Benefits, Economic efficiency, Federal Water Pollution Control Act.
Identifiers: *Hearings, National Commission on Water Quality, Point sources(Pollution), Nonpoint sources(Pollution).

Recent hearings of the National Commission on Water Quality (NCWQ) produced testimony on a number of major issues. The witnesses generally acknowledged the necessity for meeting the technological goals designated by the Federal Water Pollution Control Act (FWPCA), but felt the 1983 deadline was too severe. The Water Pollution Control Federation (WPCF) recommended that Primary Table II and permit responsibilities be delegated to the states on request, but subject to a federal audit. While industry insisted that NCWQ had underestimated the costs associated with water pollution control programs, environmental organizations asserted that benefits accruing from those same programs had been underestimated. WPCF also recommended a flexible federal funding rate 'not to exceed 75 percent' to permit a given amount of federal money to be spent more effectively. Witnesses feared that progress achieved through the control of point source discharges may be nullified by increasing nonpoint pollution. Other issues which emerged concerned dwindling research and manpower training efforts, and the federal government's failure to commit itself to a long-term funding program, in support of water pollution control. (Rieck-Florida)
W77-08967

WHAT 208 PLANNING CAN DO: A LOCAL AND FEDERAL VIEW,
P. S. Ward.
Journal Water Pollution Control Federation, Vol 48, No 7, p 1692-96, July 1976.

Descriptors: *Federal Water Pollution Control Act, *Governmental interrelations, *Government

supports, *Planning, Water law, Regulation, Local governments, Federal government, Legal aspects, Inter-agency cooperation, State governments, Administrative agencies, Methodology, Priorities, Decision making.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, *PL 92-500, *Non-point sources(Pollution), Waste water management, Sanctions, Funding, Data base, Water planning.

At the federal level the emphasis of section 208 of PL 92-500 is placed on the production of specific outputs. One such output is expected to result in solutions to problems, such as nonpoint sources, that are not adequately addressed by the permit program or the construction grant program. The federal concept of Section 208 having definite regulatory functions differs from that found at a local level. In the Houston area section 208 is reviewed as a data base and a methodology for decision making. Impediments to section 208 at the local level revolve around time and money. The requirement of extensive review is an important safeguard, but it is a liability in terms of time. The Environmental Protection Agency (EPA) sees the slow paced political process as being a major hindrance. In the area of sanctions, neither level has developed adquate penalties to insure compliance. At the local level the prognosis for section 208 succeeding is good, as a result of high visibility, public participation, thorough review, and input from local officials. At the federal level the prognosis is guarded. The minimum goal is for a plant to produce on thirty percent of its planned output within a two year period. (Petruff-Florida)
W77-08968

SAY GOODBYE TO OCEAN DUMPING,
For primary bibliographic entry see Field 5G.
W77-08969

EPA PROPOSES UNTIMELY AMENDMENTS,
For primary bibliographic entry see Field 5G.
W77-08970

ENFORCEMENT OF MUNICIPAL PERMITS: PORTENT OF PROBLEMS,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 48, No 3, p 422-24 (March 1976).

Descriptors: *Federal Water Pollution Control Act, *Permits, *Municipalities, Discharge(Water), Industries, Legal aspects, Administrative agencies, Control, Legislation, Regulation, Financing, Treatment facilities, Industrial plants, Water pollution, Education, Penalties(Legal), Law enforcement.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972 (FWPCA Amendments of 1972), *Administrative regulations, Dischargers.

A lack of adequate resources coupled with complexities and inconsistencies in the Federal Water Pollution Control Act (FWPCA) Amendments has created a system of negotiations, cooperation and forbearance. The Environmental Protection Agency's (EPA) enforcement efforts of National Pollution Discharge Elimination System (NPDES) permits differs between industry and municipalities. Among the reasons for the discrepancy is the fact that most permits to publicly owned treatment plants have only been issued in the last year or two. The pragmatic impossibility of meeting unrealistic permit requirements is another reason for the EPA's lax enforcement efforts. Another major impediment that shields cities is their political immunity and the nature of local financing. The agency has been more prone to educating the discharger than taking enforcement actions against him. The enforcement program is at a proverbial crossroad. Whether is becomes a major force or simply a farce depends upon the reasonableness of both its actions and the law it must enforce. Perhaps the most pressing issue then, is the need for extending the 1977 deadline. According to the National Commission on Water Quality it may take until 1985 to achieve substantial compliance. (Rieck-Florida)
W77-08971

PL 92-500: NEW FEDERALISM OR FEDERAL TAKEOVER,
A. S. Heid.
Journal Water Pollution Control Federation, Vol 48, No 2, p 238-40 (February 1976).

Descriptors: *Federal-state water rights conflicts, *State governments, *Administrative decisions, Legal aspects, Legislation, Administrative agencies, Coordination, Decision making, Governments, Political aspects, Water policy, Regulation, Federal government, Water law, Governmental interrelations.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, PL 92-500.

The Federal Water Polluton Control Act (FWPCA) Amendments of 1972 are a classic case of federal takeover stemming from Congress' dissatisfaction with cleanup efforts by the states. Examination of the Act's early implementation stages indicates that the Environmental Protection Agency (EPA) initially attempted to direct the entire effort rather than work cooperatively with the states. It has been a case of Congress enacting and the EPA implementing uniform national legislation rather than a flexible federal law. This is demonstrated in the Act's verbosity, its attempt to mandate specific requirements and deadlines for the EPA and the states, and the desire to have something for everbody. In addition, the states have so far been unable to influence many of the EPA's crucial implementation decisions that further erode their freedom of action. The Environmental Protection Agency defines which methods are 'reasonable', 'practical' or 'best available'. It succeeds in controlling the process while failing to stick to the Act's schedule. Many of those involved pay only lip service to the concept of intergovernmental sharing of responsibility and power. Legislators are apparently more concerned with costs of environmental controls rather than governmental power principles. (Rieck-Florida)
W77-08972

SPILL PENALTIES DRAW CRITICISM,
J. T. Sliter.
Journal Water Pollution Control Federation, Vol 48, No 2, p 236-37 (Feb 1976).

Descriptors: *Chemicals, *Penalties(Legal), *Impaired water quality, *Economic impact, Negligence, Legal aspects, Assessments, Law enforcement, Regulation, Water pollution, Federal Water Pollution Control Act, Water pollution control, Water pollution sources, Economic justification, Insurance, Barges, Transportation, Chemical industry, Legislation.
Identifiers: Spills, Misconduct, Administrative regulations, Hazardous substances.

The Environmental Protection Agency (EPA) recently proposed rules to deal with spills of hazardous chemicals and other materials in waterways. It designated more than 300 chemicals as hazardous materials and set fines and penalties that may range from $500 to $5 million in case of a spill. Some people fear the maximum penalty will normally be no more than $5,000 per spill, regardless of its severity. The EPA has 2 options in assessing penalties. It can either charge between $500 and $5,000 per spill or base the fine on the number of units spilled multiplied by a penalty rate established by the agency. The agency recently announced that only when the discharge is the result of gross negligence or misconduct will it apply the more severe penalty. The agency is thus attempting to provide an economic incentive to prevent the spill of hazardous materials while simultaneously trying to reduce adverse economic impact on industry. There are serious questions over whether these proposed minor penalties will be an effective deterent to spills of hazardous chemicals. (Rieck-Florida)
W77-08973

AS AN INCIDENT OF NATIONAL SOVEREIGNTY, THE UNITED STATES HAS PARAMOUNT RIGHTS AND POWER IN THE SEABED AND SUBSOIL OF THE OUTER CONTINENTAL SHELF,
S. O. Spinks.
Georgia Journal of International and Comparative Law, Vol 5, p 580-588 (1975).

Descriptors: *Water resources development, *Submerged Lands Act, *Legislation, *Continental Shelf, *Federal-state water rights conflicts, Judicial decisions, Legal review, Natural resources, Oil wells, Federal government, State governments, Federal jurisdiction, State jurisdiction, Legal aspects, Continental margin, Oceans, Oil fields, Natural gas.

The Supreme Court, in a 1975 case, held that where a conflict existed between the federal government and 13 Atlantic Coast States as to ownership of rights on the Continental Shelf, the federal government should prevail. The practical effect of this decision was to vest in the federal government ownership of the Continental Shelf's rich oil deposits at a point beginning three miles from shore. It is not certain that the federal government really desired this effect; the author points out that Congress may pass legislation mitigating the severity of this decision toward the states by following the Submerged Lands Act of 1953. The effect of that act was to nullify a prior Supreme Court decision that gave ownership of all submerged lands within the three-mile belt seaward of the tidelands to the federal government. Although legally the federal government does have absolute rights to all Continental Shelf deposits, it may be politically impractical for the states to be left out altogether. (Frank-Florida)
W77-08974

RECENT DEVELOPMENT, ENVIRONMENTAL LAW--WATER POLLUTION.
For primary bibliographic entry see Field 5G.
W77-08975

A RATIONAL NATIONAL POLICY ON PUBLIC USE OF THE BEACHES,
House, Washington, D.C.
R. C. Eckhardt.
Syracuse Law Review, Vol 24, No 3, p 967-88 (Summer 1974). 1 append.

Descriptors: *Seashores, *Public rights, *Beaches, *Easements, *Public access, Legal aspects, Legislation, Common law, Civil law, Coasts, Sands, Shores, Federal government, Littoral, State governments, State jurisdiction, Alabama, California, Connecticut, Florida, New Jersey, New York, Oregon, Texas, Washington.
Identifiers: *Coastal waters, *Contiguous zone, *Coastal zone management, *Sovereign immunity, Open Beaches Bill.

Congressman Bob Eckhardt (D-Texas) has proposed national legislation to ensure the American public's right to enjoy front lands. The Eckhardt Bill, H.R. 4932, guarantees, consistent with property rights of littoral landowners, free and unrestricted public use of ocean beaches. In support of the bill Eckhardt compares common law aspects of beach ownership to recent developments in case law in Texas, Oregon, New Jersey and other states. The controversy of public access concerns itself not only with who has title to the land in dispute, but also with the problem of how to define the area of dry sand beach sought to be protected. Different states have used various stan-

dards and rules of common civil law to define who owns title to the areas in question. The passage of this bill would clarify federal public policy and would demonstrate federal recognition of a difference between ownership and the right of public access to the sea. H.R. 4932 would allow the states to protect the use of the beaches and provide funds for the purchase of beaches for the public; the states would retain all control over such beaches acquired by law or by condemnation. (Morse-Florida)
W77-08976

WETLANDS PROTECTION UNDER THE CORPS OF ENGINEER'S NEW DREDGE AND FILL JURISDICTION,
For primary bibliographic entry see Field 5G.
W77-08977

PORTER--COLOGNE WATER QUALITY CONTROL ACT.
Cal Water Code Ann secs 13000 thru 13361 (West 1971), as amended, (Supp 1976).

Descriptors: *California, *Administrative agencies, *Regulation, *Legislation, *Water Quality Act, Water quality control, Waste disposal, Water pollution, Water quality, Water quality standards, Law enforcement, Water policy, Legal aspects, Social aspects, State governments, Political aspects, Penalties(Legal), Permits, Water permits, Control, Management, Water law, Permits.
Identifiers: *Porter-Cologne Water Quality Control Act, Injunctions(Prohibitory), Notice, Administrative regulations.

In order to provide for the health, safety and welfare of its people, California has established state and regional water quality boards. The boards will be composed of gubernatorial appointees who will serve four year terms. The state board shall oversee regional boards and develop comprehensive long range water policy. The state will be divided into nine regions. Each regional board will have nine members drawn from such backgrounds as agriculture, industry, government and environmental organizations. Regional boards will hold public hearings, make investigations and issue policy statements relating to any water quality matter within its jurisdiction. The regional boards will also aid the state board in establishing the overall water quality policy. Additionally, the regional boards will control local waste discharge programs. The boards will assess the impact of the discharge of waste into state waters, and issue permits regulating the amount of discharge. Such permits may be enforced by fine or injunction. The board may also force any permit violator to pay the cost of clean-up. Any person disagreeing with the action of the regional board may appeal to a court of competent jurisdiction. (Moorhouse-Florida)
W77-08978

UNITED STATES V. GAF CORPORATION: A LEAK IN THE FWPCA,
For primary bibliographic entry see Field 5G.
W77-08979

TO EXTEND THE MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT (HEARING ON S 3147 TO EXTEND THE ACT 2 YEARS).
Hearings---Sub Comm on Oceans and Atmosphere--Comm on Commerce, US Senate, April 12, 1976, Serial No 91-83. 153 p.

Descriptors: *Water pollution sources, *Waste disposal, *Sewage sludge, *Oceans, Legal aspects, Administrative agencies, Administrative costs, Sampling, Sediments, Coasts, Continental shelf, Cost allocation, Dredging, Industrial wastes, Outfall sewers, Permits, Pollutant identification, Pollutants, Sludge disposal, Sludge treatment, Wastes.
Identifiers: *Coastal waters, *Hazardous substances, *Congressional hearings, *Ocean dumping, Funding.

Bill S.3147 proposes to extend the Marine Protection, Research, and Sanctuaries Act for two years and to allocate $4.8 million per year for fiscal years 1977 and 1978. The thrust of the testimony heard on April 12, 1976 was concerned with the problems associated with ocean dumping of sewage sludge, industrial wastes and dredge spoils. Witnesses included representatives from the Environmental Protection Agency (EPA), Maryland Department of Natural Resources, General Accounting Office, University of Southern California, US Army Corps of Engineers, National Wildlife Federation, Ocean City, Maryland, US Coast Guard, and the National Oceanic and Atmospheric Administration. Most of the testimony was concerned with the hazards of the present ocean dumping policy and the need for improved monitoring techniques as well as viable alternatives to this method of waste disposal. The hearing was adjourned without any action by committee. (Morse-Florida)
W77-08981

AMEND THE MERCHANT MARINE ACT OF 1920 (HEARINGS ON S 2422 TO INCLUDE THE VIRGIN ISLANDS WITHIN THE SCOPE OF THE ACT WITH RESPECT TO TRANSPORTATION OF OIL AND OIL PRODUCTS).
Hearings---Sub Comm on Merchant Marine--Comm on Commerce, US Senate, February 25, March 30, 1976. Serial No 94-75. 99 p.

Descriptors: *Virgin Islands, *Oil, *Ships, *Transportation, Costs, Cost comparisons, Legislation, United States, Federal government, Administrative agencies, Water law, Legal aspects, Cost analysis, Economics, Economic feasibility, Foreign countries, Foreign trade.
Identifiers: *Congressional hearings, Vessels, Petroleum products, Merchant Marine Act of 1920.

The proposed bill to amend the Merchant Marine Act of 1920 would apply to the Virgin Islands petroleum trade the provisions of section 883 of title 46 of the United States Code limiting the transportation of merchandise by water between points in the United States to vessels built in and documented under the laws of the United States. The measure is limited to crude oil, residual fuel oil, and refined petroleum products. Other merchandise, commodities or passengers are not affected by the legislation. The United States Department of the Interior opposes the enactment of the bill, since the principal effect of the bill would substitute shipping by American vessels for the substantial volumes of petroleum presently carried by foreign ships. Foreign vessels are considerbly less expensive than American, and oil transported by American ships costs substantially more. The department believes that the enactment of the bill would raise petroleum costs of American consumers and would injure the economic health and development of the Virgin Islands. (Rieck-Florida)
W77-08982

TOXIC POLLUTANT EFFLUENT STANDARDS FOR ALDRIN/DIELDRIN, DDT, ENDRIN, AND TOXAPHENE,
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08983

EFFLUENT GUIDELINES AND STANDARDS FOR FERTILIZER MANUFACTURING POINT SOURCE CATEGORY, UREA AND AMMONIUM NITRATE SUBCATEGORY.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08984

INTERIM PRIMARY DRINKING WATER REGULATIONS: PROMULGATION OF REGULATIONS ON RADIONUCLIDES.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08985

EFFLUENT GUIDELINES AND STANDARDS FOR IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY.
Environmental Protection Agency, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08986

CONTROL OF POLLUTION BY OIL AND HAZARDOUS SUBSTANCES, DISCHARGE REMOVAL.
Coast Guard, Washington, D.C.
For primary bibliographic entry see Field 5G.
W77-08987

PERMIT PROGRAM REGULATIONS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS.
Environmental Protection Agency, Washington, D. C.
For primary bibliographic entry see Field 5G.
W77-08988

SITE EVALUATION AND PRECONSTRUCTION TESTING AT POTENTIAL DEEPWATER PORT LOCATIONS.
Coast Guard, Washington, D. C.
Federal Register, Vol 41, No 79, p 16798-801, April 22, 1976.

Descriptors: *Harbors, *Coastal structures, *Port authorities, *Ships, *Oil industry, Deep water, Bodies of water, Engineering structures, Transportation, Navigation, Water pollution sources, Navigable waters, Oceans, Oil, Oil pollution, International waters, Administrative agencies, Regulation, Governments, Administrative decisions.
Identifiers: *Deepwater Port Act of 1974, *Environmental impact statement, *Rulemaking, *Deepwater ports, *Ports, Tankers, Shipping, Coastal zone.

The procedural regulations concerning license applications under the Deepwater Port Act of 1974 have been amended to require that advance notice and site evaluation reports be furnished to the Coast Guard by any individual engaged in deepwater port site evaluation or preconstruction testing, and to establish a mechanism whereby the Commandant may regulate these activities. The regulations as originally proposed had required advance notice, but had not prescribed specific control measures. In response to public comment that the original proposal offered no assurance that such activities would be conducted in a manner consistent with the Act, the Coast Guard developed a second proposal requiring prior approval and expanding the control mechanism governing suspension, revocation, and cancellation of site evaluation authorizations. The response to the second proposal was that the legislative history of the Act itself showed no intent to require prior approval. The Coast Guard agreed and eliminated the requirement from the amendment. In its final form, the rule requires that written notice must be submitted to the Commandant, U.S. Coast Guard, 10 days prior to the commencement of any activity; it specifies the kinds of activities which may be undertaken without submission of additional information; and it delineates conditions under which the Coast Guard may order suspension or prohibition of activies. (Sloan-Florida)
W77-08989

UNITED STATES V 62.61 ACRES OF LAND, MORE OR LESS, IN CITY OF VIRGINIA BEACH, COMMONWEALTH OF VIRGINIA (A COMPENSABLE PROPERTY RIGHT AS MIGHT EXIST IN A WHARF OR PIER WILL NOT BE FOUND IN A JETTY CONSTRUCTED IN NAVIGABLE WATERS),
547 F2d 818-21 (4th Cir 1977).

Descriptors: *Virginia, *Riparian rights, *Navigable waters, *Jetties, *Condemnation, Real property, Coastal structures, Legal aspects, Banks, Economics, Value, Riparian waters, Bodies of water, Ownership of beds, Piers, Judicial decisions, Water law, Chesapeake Bay, Bays, Compensation, Easements.
Identifiers: *Property interests, *Property rights.

Plaintiff property owners in a United States condemnation suit claimed compensable interest in a stone jetty extending 800 feet from their land into Chesapeake Bay. The jetty had been built by the Pennsylvania Railroad under a federal permit thirty-eight years before plaintiffs acquired the property to which the jetty abutted. The deed granting title to the property had contained a catchall clause conveying rights to any interest the grantor had in 'muds, flats and land under the water of Chesapeake Bay'. The United States District Court and the Fourth Circuit Court of Appeals held that the original interest of the railroad, under federal permit, was a non-conveyable easement and that the land on the bottom of Chesapeake Bay is owned by the State of Virginia. The lower court held, and the appeals court affirmed, that rights 'to extend a wharf or pier are not to be equated to a jetty'. Ownership of a wharf or pier is normally a compensable riparian right, as such structures are bilt from the shore outward for the purpose of reaching navigable waters, and are mere appurtenances to the shore. A jetty is distinguishable both by its primary function, which is to protect a channel entrance, and by its construction, which incorporates it into the water's floor. (Sloan-Florida)
W77-08990

ALMEDA COUNTY WATER DISTRICT V NILES SAND AND GRAVEL COMPANY, INC. (USE OF CORRELATIVE RIGHTS DOCTRINE TO DEFEAT CLAIM OF INVERSE CONDEMNATION),
112 Cal Rptr. 846-55 (Ct App 1974).

Descriptors: *California, *Percolating water, *Eminent domain, *Reasonable use, *Condemnation, Groundwater, Subsurface waters, Competing uses, Relative rights, Excavation, Dewatering, Compensation, Judicial decisions, Water districts, Legal aspects, Water law, Water rights, Water shortages.
Identifiers: *Injunctive relief, *Inverse condemnation, Groundwater management.

Appellants operated sand and gravel quarries overlying the Niles Basin; respondent was a county water district whose water replenishment program raised the underground water table to a level below which appellants' pits had been excavated, causing flooding in the pits. Appellants pumped out and discharged several billion gallons of that water into San Francisco Bay. Evidence that the public's water needs were critical throughout California and the district was in the record. Appellants sued the district for compensation under inverse condemnation, alleging that the flooding of the pits constituted a 'taking' of property for public use. Respondents sought to enjoin the operators from discharging and wasting its water. The appellate court here affirmed the trail court's decision in favor of the district. It held that the doctrine of correlative rights--where the rights of the water of each landowner overlying the basin are limited by his reasonable use thereof--was a public servitude that had existed upon appellants' property; injunctive relief was justified by the finding that appellants' pumpoff and discharge of water amounted to an unreasonable use thereof. (Jones-Florida)
W77-08991

SZELES--NATALE, INC. V BOARD OF COMMISSIONERS OF SWATARA TOWNSHIP, DAUPHIN COUNTY (FLOOD CONTROL AIDED BY LAND DEVELOPMENT RESTRAINTS),
368 A2d 1336-38 (Cwth Ct Pa 1977).

Descriptors: *Administrative decisions, *Supervisory control(Power), *Permits, *Flood control, *Pennsylvania, Administrtive agencies, Building codes, Ponding, Ponds, Legislation, Regulation, Land development, Land use, Land management, Judicial decisions, Flood protection, Local governments, Surface waters.
Identifiers: *Administrative regulations, Plats, Flood retention ponds.

Plaintiff developer sought review of an order dismissing his appeal from the denial of plat approval by defendant township board of commissioners. Plaintiff, relying on an ordinance which established a township planning commission, claimed that the ordinance delegated authority to the commission to grant final plat approval. Defendant claimed that the ordinance gave the commission advisory powers only, and that the defendant retained power of final plat approval. The court held for the defendant, finding that the board had reserved approval power for itself. The court further found that the controverted plat was preliminary in nature, rather than final. Plaintiff also contended that the defendant abused its discretion by relying on testimony of expert witnesses in its decision to deny the permit. Defendant asserted the possibility of flooding and the possible adverse effects of ponds proposed by the plaintiff. The court found that this issue resolved itself into a question of the credibility of experts, thus it refused to declare that the defendant had abused its discretion by giving greater weight to the testimony of one expert over that of another. Nor did the court accept the plaintiff's contention that the denial of this development plan amounted to an unconstitutional deprivation of land. (Petruff-Florida)
W77-08992

IN RE CITY OF WHITE BEAR LAKE (STANDARD FOR GRANTING OF PERMITS UNDER THE MINNESOTA WATER MANAGEMENT LAW).
247 NW2d 901-07 (Minn 1976).

Descriptors: *Minnesota, *Permits, *Water management, *Standards, Judicial decisions, Legislation, Legal aspects, Legal review, Water law, Administrative decisions, Natural resources, Administrative agencies, State governments, Regulation, Land management, Conservation, Construction.
Identifiers: Evidence.

The Commissioner of natural resources appealed from an order and judgment of the Ramsey County District Court reversing the commissioner's order denying respondent city's application for a permit to encroach upon the bay of a lake to construct a roadway. The district court found that a 1973 amendment to the Minnesota Water Management Law, stating that in all permit applications the applicant has the burden of proving that the proposed project is reasonable, practical and will adequately protect the public safety, created a higher standard for granting of permits. The Supreme Court determined that the amendment did not create a higher burden because the amendment was only a restatement of a well-established rule of administrative law. The only other issue in the case was whether there was sufficient evidence before the commissioner to support a denial of the permit. The Supreme Court found that where there was substantial evidence before the commissioner that pollution, impairment, or destruction of natural resources would occur as a result of the granting of the permit, and feasible alternatives were available, the commissioner's denial of the permit was justified. (Hilburn-Florida)
W77-08993

WATER RIGHTS ADJUDICATION ACT.
Tex. Water Code Ann secs 5.301 thru .341 (1972).

Descriptors: *Water utilization, *Water management, *Texas, Water control, Water demand, Water distribution(Applied), Water policy, Water resources, Water supply, Water allocation(Policy), Beneficial use, Consumptive use, Riparian rights, Municipal water, Administration, Water districts, Water law, Legal aspects, Water permits.
Identifiers: Watermaster, Water Rights Adjudication Act.

The stated purpose of this statute is to require recordation of claims of water rights in the state of Texas, to limit such claims to actual use, and to provide for adjudication and administration of such claims. The statute treats existing claims under previous statutory law and common law riparian rights, and establishes a procedure for the filing of new claims. Also provided for is a system for administering water rights and investigating and adjudicating claims. Among the specific provisions are: water divisions, to be created throughout the state; appointment of a watermaster for each water division; duties and regulatory powers of the watermasters; and provision for notice and appeals procedures for parties whose rights are subject to determination under the statute. The statute allows broad discretionary powers to vest in the Water Rights Commission. (Sloan-Florida)
W77-08994

UNLAWFUL USE, DIVERSION OR WASTE OF STATE WATER.
Tex Water Code Ann secs 5.081 thru 5.121 (1972).

Descriptors: *Texas, *Watershed management, *Water management(Applied), *Appropriation, *Water rights, Canals, Irrigation systems, Water utilization, Water sources, Water supply, Water law, Legal aspects, Administration, Water policy, Agriculture, Governments, Regulation.

Subchapter C of the Texas Water Code establishes regulations for taking, appropriation, or diversion of water. Possession of state water when the right to its use was not acquired in accord with the regulations is prima facie evidence of a violation. A separate offense is committed for each day a person takes water in violation of the Code. No permanent water rights may be sold without a previously perfected right or a permit. No person may transfer water from one watershed to another without a permit. No person may interfere with a headgate or water box, or other work which is the property of another without lawful authority. No person may allow water to be impounded in a manner that damages the property of another; any person whose property is so damaged has remedies at law and in equity. The Texas Water Commission may make and enforce regulations in regard to diversion of floodwaters released from a reservoir on an international stream. No person may allow Johnson gross or Russian thistle to go to seed within ten feet of a waterway lying on his land. No person may pollute or allow anything but a beneficial use of, water contiguous to a canal or irrigation system. No person may obstruct a navigable stream. (Sloan-Florida)
W77-08995

SNAKE RIVER INTERSTATE COMPACT.
Idaho Code Ann sec 42-3401 (Supp 1976).

Descriptors: *Idaho, *Wyoming, *Interstate compacts, *Interstate rivers, *Water resources development, Interstate, State jurisdiction, State governments, Water allocation(Policy), Water distribution(Applied), Water resources, Flood control, Drainage programs, Drainage area, Preferences(Water rights), Governmental interrelations.
Identifiers: *Snake River Interstate Compact.

In October of 1949 Idaho and Wyoming approved the Snake River Compact. The agreement sought to: achieve efficient use of the Snake River; provide for the equitable distribution of its waters; eliminate interstate controversies; promote interstate comity; recognize that the development of the drainage area of the Snake River and its tributaries is the most efficient utilization of such waters; and to achieve joint action with the United States in the control of floods and the development and use of such waters. The waters of the Snake River are allocated between the two states for storage or direct diversion. Waters diverted into either state may not be used outside of specified drainage areas without the approval of the other state. The waters of the Snake River may be impounded for the generation of power, but this use shall be subservient to domestic, stock, or irrigation uses. Each state, and the United States, may construct or use works within the compacting states. The failure to fully utilize provided allocations shall not constitute a forfeiture of such rights to use. (Josepher-Florida)
W77-08996

HEADGATES AND MEASURING DEVICES: DISTRIBUTION OF STORED WATER.
Idaho Code Ann secs 42-701 thru 42-802 (1948).

Descriptors: *Idaho, *Water distribution(Applied), *Water measurement, *Water level recorders, *Water management(Applied), Measurement, Water levels, Water delivery, Water transfer, Water level fluctuations, Water conveyance, Streambeds, Diversion dams, Diversion structures, Appropriation, Control structures, Controlled drainage.
Identifiers: Headgates, Measuring devices.

Appropriators or users of the public waters of Idaho must maintain headgates and controlling works at the point where the water is diverted. These works should be constructed so as to allow state officials to regulate the flow of the water at the diversion point. Measuring devices may also be required by the state to determine the amount of water diverted from streams into ditches. Plans for headgates, rating flumes or other measuring devices must be approved by the state. Appropriators or users who refuse to maintain or construct satisfactory controlling works will have their water supply shut off after reasonable notice has been given. Persons using any streams or channels or tributaries thereof, as impounding reservoirs shall place measuring devices at suitable intervals on said waters. Measuring devices shall be installed at a point above and near to the backwater of impounding reservoirs. Owners desiring to use the bed of a stream or a natural water course to convey stored water shall notify the state which will then adjust the headgates of ditches not entitled to such water to insure that the owner will secure his entitled volume. Persons interfering with such adjustments of headgates may be punished by fines and imprisonment. (Josepher-Florida)
W77-08997

DISTRIBUTION OF WATER AMONG APPROPRIATORS.
Idaho Code Ann secs 42-601 thru -607 (1948), as amended, (Supp 1976).

Descriptors: *Idaho, *Water distribution(Applied), *Water management(Applied), *Water districts, *Water allocation(Policy), Water delivery, Prior appropriation, Measurement, Water levels, Canals, Ditches, Water measurement, Local governments, Water sources, Water utilization, Water policy, Appropriation.

Idaho is divided into three geographically determined water divisions to facilitate the administration and control of public waters. The department of reclamation has immediate direction and control of the distribution and diversion of water from all streams to canals and ditches. The distribution of waters is in accordance with rights of prior appropriation. The department shall divide the state into water districts. Each district is to have an independent source of water supply so that separate districts do not compete for uses from a single water source. District meetings and procedures are provided for. The department may request watermasters to file reports containing information regarding the district's present and future water supplies and needs. In times of water scarcity, the watermaster shall distribute waters from the district based on prior rights of appropriation. Persons who do not own adjudicated rights are accorded subsequent rights. (Josepher-Florida)
W77-08998

GROUND-WATER USE ACT (REGULATION OF GROUND WATER RESOURCES THRU A PERMIT SYSTEM).
Hawaii Rev Stat secs 177-1 thru -35 (1968).

Descriptors: *Hawaii, *Groundwater resources, *Groundwater availability, *Groundwater, Legislation, Water management(Applied), Water supply, Water resources development, Recharge, Water utilization, Water pollution, Beneficial use, Domestic water, Prescriptive rights, Permits, Regulation, Water permits, Water law, Competing uses, Water allocation(Policy).
Identifiers: Administrative regulations, Certification, Groundwater management, Domestic use, Preserved use.

The board of land and natural resources of the state of Hawaii is herein authorized to designate ground water areas subject to regulation if any of the following conditions exist: (1) the use of ground water exceeds the rate of recharge; (2) ground water levels are declining excessively; (3) chloride content is materially increasing; (4) excessive preventable waste is occurring; or (5) proposed development would lead to one of the above. No person shall make any use of the water of an area so designated except as provided in this act, nor can any prescriptive rights to water resources accrue therein. Domestic uses of ground water in designated areas may continue and new domestic use may be initiated upon filing a report with the board. Any other existing beneficial uses may be preserved by filing a detailed declaration of use with the board and receiving certification of the same. Such preserved uses will be extinguished if not used for four consecutive or five of seven years. Any other withdrawal of water from a designated area may be made only upon issuance of a permit. Such permits shall be granted for beneficial uses not interfering with preserved and domestic uses or more beneficial uses where there is water available. The act further provides numerous procedural safeguards to insure the proper designation of areas, consideration of permits, and exercise of emergency powers. (Moorhouse-Florida)
W77-08999

MOLOKAI IRRIGATION AND WATER UTILIZATION PROJECT.
Hawaii Rev Stat secs 175-1 thru - 8 (1968).

Descriptors: *Hawaii, *Irrigation programs, *Water supply, *Comprehensive planning, Legislation, Development, Area redevelopment, Governments, State governments, Administrative agencies, Potential water supply, Water allocation(Policy), Competing uses, Water utilization, Multiple-purpose projects, Economics, Financing, Planning, Irrigation, Irrigation districts.
Identifiers: *Molokai Irrigation and Water Utilization Project, *Hawaii board of land and natural resources.

Tkhe state of Hawaii has established a special irrigation and water utilization project for the island of Molokai. The project will be administered by the board of land and natural resources. The board shall have all powers of eminent domain, the power to survey and conduct all necessary studies in relation to the project, and the power to lay and collect assessments from the acreage served. All funds collected from the operation of the project will be segregated into a special fund in the state treasury and will be used exclusively for the Molokai project. No actual construction of the project shall be authorized until all lands and water rights necessary for the project are satisfactorily under the board's control. (Moorhouse-Florida)
W77-09000

MIANUS RIVER PRESERVATION COMMITTEE V. ADMINISTRATOR, ENVIRONMENTAL PROTECTION AGENCY (JURISDICTION OF FEDERAL APPEALS COURT FOR PERMITS ISSUED BY STATE AGENCY UNDER NPDES).
541 F.2d 899-910 (2d Cir. 1976).

Descriptors: *Federal jurisdiction, *Connecticut, *Administrative agencies, *Permits, Legal review, Adjudication procedure, Federal government, State government, State jurisdiction, Regulation, Administrative decisions, Co-ordination, Governmental interrelations, Interagency cooperation, Control, Judicial decisions.
Identifiers: *Federal Water Pollution Control Act Amendments of 1972, Administrative regulations, State pollution permits.

Petitioner environmental committee sought review in the United States Court of Appeals of a National Pollution Discharge Elimination System (NPDES) permit issued by the Commissioner of the State of Connecticut Department of Environmental Protection. A local water company had for many years discharged chemically treated flocculants into a nearby river. The state agency mandated completion of facilities for reduction of the discharges, and subsequently extended the compliance date. When the 1972 Amendments to the Federal Water Pollution Control Act (FWPCA) became effective, permitting transfer of the responsibility for issuing discharge permits to complying state agencies. Connecticut's program was approved, and the orders pertaining to the water plant apparently transformed into NPDES permits. Petitioner alleged noncompliance with the FWPCA directive for best practicable control technology, and impossibility of compliance. Respondent state agency defended on the merits, and alleged lack of jurisdiction, as the review provision provides only for federal review of the federal administrator's action. The court dismissed the action for lack of jurisdiction holding that state permitting programs were not an unconstitutional delegation of the Administrator's authority and that no Administrator's action was involved in the state permit modification. (Molloy-Florida)
W77-09001

COMMONWEALTH OF MASSACHUSETTS V. UNITED STATES VETERAN'S ADMINISTRATION (NOTICE OF SUIT PROVISIONS OF THE FWPCA; FEDERAL COMMON LAW NUISANCE ACTIONS).
541 F.2d 119-23 (1st Cir. 1976).

Descriptors: *Massachusetts, *Federal Water Pollution Control Act (FWPCA), *Permits, *Jurisdiction, Federal government, Administration, State governments, Legal review, Waste treatment, Governmental interrelations, Administrative agencies, Control, Regulation, Water pollution, Abatement, Effluents, Hospitals.

Identifiers: *National Pollutant Discharge Elimination System, *Notice, *Nuisance(Legal aspects), Federal Water Pollution Control Act Amendments of 1972, Federal common law, Sovereign immunity.

Plaintiff state brought suit in federal district court alleging that Veterans Administration Hospital had violated the conditions of its National Pollution Discharge Elimination System (NPDES) permit issued under the Federal Water Pollution Control Act (FWPCA). The Veterans Administration conceded its failure to comply with the timetable for tie-in to the municipal sewage system, and therefore its technical violation of the permit, but denied jurisdiction. The FWPCA provides that no action may be commenced prior to 60 days after the plaintiff has given notice of the alleged violation. Plaintiff gave only 40 days notice, and alleged on appeal that since no amount of administrative action during the post notice period could cure the past violations of the permit conditions, no purpose would be served by deferring recourse to the courts. The United States Court of Appeals for the First Circuit noted that administrative action could still hasten compliance with the permit, and found that sovereign immunity barred action under the difficult issues involved in the federal common law of nuisance. Finding that the FWPCA's waiver of immunity applied only to actions under the FWPCA, the court affirmed dismissal of the action. (Molloy-Florida)
W77-09002

HOMEOWNERS EMERGENCY LIFE PROTECTION COMMITTEE V. LYNN (ENJOINING OF MAJOR FEDERAL ACTIVITY WITH ALLEGED INADEQUATE ENVIRONMENTAL IMPACT STATEMENT).
541 F.2d 814-19 (9th Cir. 1976).

Descriptors: *Dams, *Environmental control, *Administrative agencies, *California, Federal government, Project planning, Water supply, Financing, Government finance, Grants, Governmental interrelations, Water resources development, Projects, Disasters, Earthquakes.
Identifiers: *Environmental impact statement(EIS), *Injunctive relief.

Plaintiff, unincorporated association of homeowners and taxpayers, sought to enjoin the construction of a dam and reservoir project by the City of Los Angeles. City applied for Federal Disaster Relief to replace the dam after an earthquake had destroyed the old one. Before relief was granted, the city elected to go ahead with construction and to ultimately finance the project with local water reserve bonds if federal financing was denied. Plaintiff then alleged that the project was a major federal action requiring the filing of an environmental impact statement (EIS). During the plaintiff's appeal, federal agencies filed the EIS and the federal funding was granted. The court noted that the issuance of the federal grant made the project a major federal action and concluded that the grant was made under a 1970 act and did not contain a 1974 exemption from Environmental Protection Agency requirements. The EIS must consider all reasonable alternatives. The compliance and issue was remanded to the trial court for a factual determination. The trial court was also instructed to reconsider whether construction should be enjoined until that factual determination was made. (Molloy-Florida)
W77-09003

MC CORMICK V LAWRENCE (CONSTITUTIONALITY OF NEW YORK STATUTE AIMED AT PROMOTING GOVERNMENTAL INTEREST IN PRESERVING APPEARANCE OF AN AREA).
387 NYS2d 919-20 (App Div 1976).

Descriptors: *New York, *Parks, *Aesthetics, *Permits, Judicial decisions, Legislation, Legal aspects, Water law, Governments, Preservation, Land use, Natural resources, Land management, State governments, Construction, Administrative agencies, Administrative decisions, Constitutional law.
Identifiers: *Administrative regulations.

Landowners sought review of a decision of the Adirondack Park Agency prohibiting them from constructing boathouses on their property. Petitioners owned property within the boundaries of the Adirondack Park. In order to develop this tract of land, petitioners were required by the Executive Law to apply for an Adirondack Park Permit. The Agency approved development with the condition that no boathouses be constructed on the shores of the lake. Petitioners commenced pleadings to have respondent's determination amended to permit the erection of boathouses. The Supreme Court granted respondent's motion to dismiss the petition and for summary judgment. On appeal petitioners contended that the statute granting the Agency the authority to impose conditions in permits was an overbroad delegation of power. Petitioners also argued that the Agency's determination was arbitrary and capricious. The Appellate Division found that the legislation provides sufficient standards to guide the Agency in its determinations and that the Agency's restriction forbidding construction of boathouses based on adverse aesthetic effect, was not arbitrary, capricious, or an abuse of discretion. (Hilburn-Florida)
W77-09004

RYKAR V GILL (STATE'S REFUSAL TO ALLOW UPLAND OWNER TO FILL ADJACENT MARSHLAND BECAUSE OF OWNER'S ACCESS TO DEEP WATER BY USE OF WHARFING TECHNIQUES),
6 ERC 1333-35 (Conn Super Ct 1973).

Descriptors: *Connecticut, *Deep water, *Constitutional law, *Land forming, Land use, Land development, Dredging, Water rights, Water quality control, Water policy, Water pollution control, Environmental control, Environmental engineering, Marsh management, Marshes, Wetlands, Water law, Water control.
Identifiers: *Fill permits, *Coastal waters.

Plaintiff landowner brought this action seeking a reversal of the state's denial of his application for a dredge and fill permit to allow plaintiff to fill the adjacent marshland and construct a deep harbor facility. Plaintiff contends that the denial of his present application deprives him of his right to access to deep water, which is one of the exclusive yet qualified rights of an upland owner. Plaintiff further contended that such right is deemed a property right and entitled to constitutional protection, including compensation when these rights have been taken by the state. The court upheld the earlier finding that plaintiff was not the owner of a portion of the wetlands. The court further held that if access to deep water could be gained by means other than filling, then it cannot be found to be an unreasonable exercise of the police power for the state to foreclose the marsh destruction and deny the fill permit application. Here the plaintiff could have access to deeper water via wharfing out, and the fact that wharfing out may be more costly is not of constitutional significance. The state's refusal to issue the permit was therefore upheld by the court as a reasonable exercise of its police power. (Welch-Florida)
W77-09005

MC ILRAY V HAMILTON (PERMISSIVE USE OF SPRING OVERFLOW DEFEATS PRESCRIPTIVE RIGHT CLAIM),
539 SW2d 669-78 (Mo Ct App 1976).

Descriptors: *Missouri, *Judicial decisions, *Prescriptive rights, *Spring waters, Water law, Legal aspects, Real property, Easements, Land tenure, Riparian rights, Legal review, Water rights, Farms, Springs, Bodies of water, Overflow, Subsurface waters, Adjacent landowners.
Identifiers: Injunctive relief, Permissive use, Easement by prescription.

Plaintiff, executor of landowner's estate, sought a permanent injunction to restrain adjoining landowners from blocking a roadway across their farm and from diverting natural flow of water from a spring located on their farm. Plaintiff argued that through open, notorious, uninterrupted, and adverse use of the roadway and spring water for over 10 years, decedent had acquired an easement by prescription. Defendants, admitting use by plaintiff, contended that such use had its origin in permission, and thus could not ripen into a prescriptive right. The trial court found defendant's theory supported by the evidence, and denied the injunction. On appeal, the court affirmed the denial of injunctive relief finding the pipe extending onto defendants' land was a permissive intrusion because defendants' predecessor in title determined where the pipe could be located and how the overflow from his trough could be captured. Plaintiff asserted a second theory for relief on appeal claiming riparian rights based upon a reasonable use of natural watercourses. The court of appeals refused to consider the argument stating that an appellant must seek review of the trial court's judgment on the same theory on which the case was tried. (Moorhouse-Florida)
W77-09006

MODINE MANUFACTURING CO V POLLUTION CONTROL BOARD OF ILLINOIS (STREAM RECLASSIFICATION AND EFFLUENT VARIANCES REQUIRED BY NEW WASTE TREATMENT TECHNOLOGY),
351 NE2d 875-79 (Dist Ct App 111 1976). 5p.

Descriptors: *Illinois, *Rivers, *Judicial decisions, *Industrial wastes, *Effluents, Water pollution, Administrative agencies, State governments, Legal review, Permits, Legal aspects, Water law, Wastes, Water pollution sources, Discharge(Water), Sanitary engineering, Waste water(Pollution), Chemical wastes, Industrial plants, Industrial water, Water quality.
Identifiers: *Illinois Pollution Control Board, *Modine Manufacturing Company, *Illinois Environmental Protection Act, Effluent limitations, Administrative regulations.

Plaintiff-manufacturer who discharged his treated effluent into an Illinois river, was developing a new waste water treatment facility which required a temporary variance from state effluents standards and a reclassification of the river to secondary-contact water. Defendant Pollution Control Board of Illinois initially granted both requests, but on rehearing reversed the secondary-contact water classification. Plaintiff appealed, contending that the Control Board was an administrative agency, created by statute, which could only conduct rehearings when specific statutory authority existed. The court pointed out that Section 5(d) and Section 26 of the Environmental Protection Act authorized the Board to establish its own rules. Secondly, plaintiff contended that the river fit the definition of secondary contact water since it was dry at times and therefore unable to support a diversified aquatic biota. The Court ruled that a diversified biota could be preserved in the mud during dry times, and re-occur when the river flowed again. Therefore, a non-continuous river flow would not affect the river's classification. The court upheld the Board's ruling that the river was for general use. (Moorhouse-Florida)
W77-09007

UNITED STATES V HOLMES (WATERS AND SUBAQUEOUS AREAS LOCATED WITHIN PERIMETERS OF A MILITARY POST),
414 F Supp 831-44 (D Md 1976). 102 p.

Descriptors: *Riparian rights, *Ownership of beds, *Prescriptive rights, *Military reservations, Public lands, Maryland, Federal government, State governments, Governmental interrelations, Trespass, Public access, Navigable waters, Legislation, Eminent domain, Preferences(Water rights), Priorities, Public rights.
Identifiers: Public trust doctrine, Subaqueous areas.

Defendant was indicted under federal statute prohibiting persons from entering military reservations for an unlawful purpose. Defendant was given a citation by military police when she was located between the high and low water marks on the shores of the Bush River on Aberdeen Proving Grounds, Maryland. The state of Maryland filed an amicus brief in support of defendant's motion to dismiss. Defendant argued that the public has a right to go on subaqueous areas regardless of who owns title to the adjacent land, and that the state had retained jurisdiction over the inland waters. The court found that Congress intended waters and subaqueous lands to fall under the statute's jurisdiction in view of regulations authorized for navigable waterways in target practice area s. The United States was found to hold title to the land and waters acquired through the eminent domain power. The state may have had a claim to subaqueous lands, but vesting of title in the federal government was not dependent on compensation. Ownership of subaqueous lands on United States Military Reservations vests in the federal government, and the state retains no rights for the public use. (Molloy-Florida)
W77-09008

PROVO-JORDAN RIVER PARKWAY AUTHORITY.
Utah Code Ann secs 65-10-1 thru -7 (Supp 1975).

Descriptors: *Utah, *Water conservation, *Rivers, *Administrative agencies, Legislation, Recreation, Wildlife, Conservation, Flood control, Reclamation, Flood plains, Water conservation, Water policy, Water utilization, Administration, Legal aspects, Regulation, Water law, Institutions, State governments, Water policy, Water resources, Comprehensive planning, Decision making, Project planning, Leadership, Management, Social aspects.
Identifiers: *Provo-Jordan River Parkway Authority(Utah), *Provo River(Utah), *Jordan River(Utah).

The Provo-Jordan River Parkway Authority and Board is hereby created to establish and co-ordinate programs for the development of recreational areas, wildlife resources, water conservation, flood control, and reclamation, restoration and preservation of points of historical interest along the Provo and Jordan Rivers of Utah and their tributaries, and within their present flood plains. The Authority's powers include the right to acquire real and personal property in the name of the state, constructing and maintaining facilities consistent with the purposes of the act, and operating, leasing or renting lawful property concessions. The Board is comprised of thirteen members, appointed as set forth by statute. Six terms of office expire on March 1, 1977, the balance on March 1, 1979. Successors shall be appointed for terms of four years each. Board members shall only receive travel expenses. The Board has power to establish the programs necessary to implement the policies of this Act, and to promulgate the rules and regulations required to effectuate the purposes of the Act. The Authority shall not permit any construction on the Provo or Jordan rivers or within their flood plains which shall be in violation of any ordinance. The Authority shall not be authorized to administer water rights. (Hadoulias-Florida)
W77-09009

WATER-USE LEASING ACT.
NM Stat Ann secs 75-40-1 thru -7 (1968).

Descriptors: *New Mexico, *Water users, *Competing uses, *Leases, *Water rights, Water demand, Water allocation(Policy), Regulation, Permits, Legal aspects, Contracts, Legislation, Water transfer, Water utilization, Water resources, Water contracts, Water control, Water law, Water conservation, Water supply.
Identifiers: Notice.

Any owner of a valid water right in New Mexico may lease to any person all or any part of the water-use due him under his water right. The use by the owner of the water right shall be reduced by the amount of water so leased, but the owner's water right shall not be affected otherwise by the lease of such use. Upon the lease's termination the water-use rights shall revert to the owner's original use and location. The lease may cover immediate or future water-use rights, but shall not be effective to accumulate water from year to year or to injure other water users. The lease shall not toll any forfeiture of water rights for nonuse, and the initial or any renewal term of lease of water-use shall not exceed 10 years. The lessee must apply to the state engineer prior to his use of such water, and the engineer shall aprove the application if the lessee has shown that his proposed use and location will not impair any existing right to a greater degree than such right would have been impaired by continued use by the owner. Provisions are made in the statute for notice of the lease, protest from any user who believes his water rights will be adversely affected, and for hearings and appeals. (Welch-Florida)
W77-09010

WATER RESOURCES AND WATER UTILIZATION IN ISRAEL,
Office of Naval Research, London (England).
R. Dolan.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A011434, Price codes: A02 in paper copy, A01 in microfiche. May 30, 1975. 14 p, 4 map, 2 tab.

Descriptors: *Irrigation water, *Water shortage, *Water management(Applied), *Brackish water, Water utilization, Permits, Saline water, Impaired water quality, Brackish-water fish, Industrial production, Agriculture, Cost-benefit ration, Water costs, Environmental effects, Desalination, Water distribution(Applied), Water demand, Deserts.
Identifiers: License, *Israel.

Israel, classified as one-half desert, one-quarter semi-arid, and one-quarter subhumid, is geographically similar to parts of California. Water management in Israel is tight. A license is required to use water in significant quantities and a permit is called for in water exploration. Water, stored in a lake, provides necessary supplies for long, dry summers. Since no more fresh water is available, efforts are directed toward better utilization of existing sources, especially in the field of agriculture. The use of brackish water (that having a salinity of 2000 or 3000 ppm) is expected to be a significant contribution. Processing the water is rejected as a viable alternative because of the cost involved. Brackish water, when mixed with fresh water, may be used for industrial and agricultural purposes. Currently, its major use is in commercial fish ponds. However, research is underway to determine the slinity tolerance of a variety of plants. Several serious drawbacks in using the brackish water involve the expense incurred in pumping it out of the ground coupled with dangerous side effects of salt build-up in the fields where it is used. (Rieck-Florida)
W77-09011

SELECTED PROBLEMS IN IDAHO GROUND WATER LAW,
Idaho Univ., Moscow. Coll. of Law.
D. L. Grant.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 097, Price codes: A05 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Legal Report, March 1975, 74 p. OWRT B-019IDA(3) and B-031-IDA(2). 14-31-001-3578, 4076.

Descriptors: *Groundwater, Planning, *Legal aspects, Economics, Pumping, Natural recharge, Management, *Idaho, *Institutional constraints, *Water rights, Legislation, Water law.
Identifiers: *Raft River Valley(Idaho), Pumping lift.

This report deals primarily with two questions: (1) How are rights to use groundwater acquired in Idaho. (2) What legal constraints limit the exercise of groundwater rights in Idaho. The main focus is upon the current Idaho Groundwater Act, although historical antecedents are also examined. Groundwater rights are aquired under the appropriation doctrine, as supplemented by a mandatory permit system. The two main constraints upon exercise of a groundwater right are that such exercise may not affect a senior water right contrary to the declared policy of the Act, and that total withdrawals from an aquifer may not exceed the reasonably anticipated average natural recharge. There are a number of unresolved ambiguities concerning the scope of the first constraint. (See also W75-02981)
W77-09049

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
C. C. Warnick, and P. J. Rassier.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 109, Price codes: A04 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, IWRRI information circular No 9, February 1975. 54 p, 2 tab. OWRT A-048-IDA(1).

Descriptors: *Electric powerplants, Powerplants, *Sites, *Legislation, *Idaho, Energy conversion, Legal aspects, Industry, State governmnts.
Identifiers: Idaho energy plants, Siting legislation.

This brief appraisal of energy siting legislation for Idaho presents in part one an analysis and comparison of drafts of two bills that were drafted prior to the beginning of the First Session of the Forty-Third Legislature of the State of Idaho; comments and explanations are presented on particular points of the legislative needs. Part two is a brief survey of other states' legislation with primary emphasis on points that might be worthy of consideration in Idaho. The third part presents two summary tables of comparative information on the legislation, some ideas for alternatives, and reasons for conclusions. This legislation in the draft form will be changing so a caution is made that these studies are still in progress and may change as further study and analysis proceed.
W77-09050

POLICY INNOVATION AND INSTITUTIONAL FRAGMENTATION,
Arizona Univ., Tucson. Inst. of Government Research.
M. Ingram, and J. Ullery.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 078, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at The 1975 National Conference on Public Administration, Chicago, Illinois, April 1-4, 1975, 38 p.

Descriptors: *Water policy, *Political aspects, *Administrative agencies, Decision making, *Legislation, Institutional constraints, Institutions, Social aspects, Social change, Social values.
Identifiers: Innovation(Policy).

The question of what is the most appropriate policy-making structure for effecting policy change has become increasingly important. The bias toward an integrated and centralized structure as best suited to the task has been and remains a dominant one in the thinking of many who are positively disposed toward change. This is a mistake. The view which associates centralization with innovation, and fragmentation with stagnation (or at best only incremental change) is simplistic and unwarranted. A part of the difficulty with the centralist position, is its lack of appreciation for the complexities of policy and policy change. Rather than conceive of policy in ideal terms and as a sort of monolithic approach, it has been suggested that more realistic conceptions are of policy as a composite of four dimensions of costs and benefits, and of innovation as occurring in a disjointed manner. A fragmented system is an appropriate mechanism for effecting disjointed innovation. While a fragmented policy-making system may not facilitate integrated innovation, such sweeping change is rarely accomplished within any type of system. It seems likely that the need for such change arises in part because of the relative insensitivity from which highly integrated systems suffer. A system which promotes entrepreneurship, encourages competition, and minimizes the costs of change tends to increase sensitivity and renders less likely the occurrence of debilitating stagnation. (See also W75-03851)
W77-09053

6F. Nonstructural Alternatives

FLOOD PLAIN INFORMATION: ALBUQUERQUE ARROYAS, PART V, ALBUQUERQUE, NEW MEXICO.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08611

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, FORT DODGE - WILROADS GARDENS, VICINITY OF DODGE CITY, KANSAS.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08612

SPECIAL FLOOD HAZARD INFORMATION REPORT: MISSOURI AND KANSAS RIVERS, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W77-08613

FLOOD PLAIN INFORMATION: OHIO RIVER, LAWRENCE COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-08614

FLOOD PLAIN INFORMATION: ASHUELOT RIVER, CITY OF KEENE, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-08615

SPECIAL FLOOD HAZARD REPORT: BUFFALO CREEK, MEADOW GROVE, NEBRASKA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-08616

FLOOD PLAIN INFORMATION REPORT, INDIAN AND DRY CREEKS, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-08617

FLOOD HAZARD INFORMATION: YAMPA RIVER AND TRIBUTARIES, STEAMBOAT SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-08619

FLOOD PLAIN INFORMATION: LLAGAS CREEK UNIT I, INCLUDING EDMUNDSON (LITTLE LLAGAS), CHURCH, SAN MARTIN, NEW, CENTER, CORRALITOS, TENNANT, MAPLE, AND FOOTHILL CREEKS, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W77-08620

ECONOMICS OF PERMANENT FLOOD-PLAIN EVACUATION,
Atlanta City Dept. of Environment and Streets, Ga. Office of Engineering.
For primary bibliographic entry see Field 6B.
W77-08856

STORM TIDE FREQUENCY ANALYSIS FOR THE COAST OF GEORGIA,
National Weather Service, Silver Spring, Md. Office of Hydrology.
For primary bibliographic entry see Field 2L.
W77-08914

6G. Ecologic Impact Of Water Development

RECREATIONAL WATER RESOURCES PROBLEMS.
Bureau of Outdoor Recreation, Washington, D.C.
For primary bibliographic entry see Field 6B.
W77-08711

EXPANSION OF THE RANGE OF SOME FISH SPECIES IN CONNECTION WITH HYDRAULIC ENGINEERING CONSTRUCTION ON THE VOLGA AND ACCLIMATIZATION WORKS, (IN RUSSIAN),
For primary bibliographic entry see Field 8I.
W77-08715

WATER AS AN ENVIRONMENTAL CONSTRAINT IN LAND USE PLANNING,
North Carolina State Univ., Raleigh. Dept. of Landscape Architecture.
R. C. Freeman, Jr.
Masters Thesis, November 1976, 83 p., 41 illus., 30 ref.

Descriptors: *Water distribution(Applied), *Land management, *Land use, *Land use planning, *Small watersheds, *Watershed management, *Water supply, Surface runoff, Water yield improvement, Water storage.

Environmental factors affecting the behavior of water are discussed, as well as the dynamics of hydrologic response under varying environmental conditions, and alternative means of controlling the hydrologic response under varying environmental conditions, and alternative means of controlling the hydrologic response characteristics of watersheds. The relationship between these factors and the establishment of an environmentally stable pattern of land uses upon which human communities can be superimposed is explored. A method is developed that would allow stream networks to behave much as they would under natural conditions. It involves infiltrating runoff close to where it is produced in lieuk of sending it somewhere else for surface storage. This method would improve stream quality by utilizing the filtering action of soil, stabilize streamflow, and positively affect ground water supplies where they are important for human consumption. The characteristics of the important elements of water and land use planning are summarized. The systems include watersheds, the hydrologic cycle, soil types, vegetative cover, geomorphology, geology, and land use patterns. The interrelationship of these elements is discussed, and the impact of development on them is explored. (Nessa-NC)
W77-08721

THE STRUCTURAL ANALYSIS OF ENVIRONMENTAL PERCEPTION AND COGNITION: A MULTIDIMENSIONAL SCALING APPROACH,
Royal Inst. of Tech., Stockholm (Sweden). Dept. of Architecture.
For primary bibliographic entry see Field 6B.
W77-08722

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 1: SUMMARY REPORT,
Wisconsin Univ. Extension, Madison; and Wisconsin Univ., Madison. Inland Lakes Renewal and Management Demonstration Project.
For primary bibliographic entry see Field 6B.
W77-08725

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3A: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08726

CHIPPEWA FLOWAGE INVESTIGATIONS. PART 3B: APPENDIXES.
Wisconsin Univ. Extension, Madison; and Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 6B.
W77-08727

APPLICATION OF TEMPERATURE PREFERENCE STUDIES TO ENVIRONMENTAL IMPACT ASSESSMENT,
Ecological Analysts, Inc., Melville, N.Y.
For primary bibliographic entry see Field 5C.
W77-08768

PROCEEDINGS: THE CONNECTICUT RIVER SYSTEM: A WORKSHOP ON RESEARCH NEEDS AND PRIORITIES.
Massachusetts Univ., Amherst. Inst. for Man and Environment; Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 6B.
W77-08808

INCIDENCE OF THE BENEFITS AND COSTS OF ENVIRONMENTAL PROGRAMS,
Harvard Univ., Cambridge, Mass.
R. Dorfman.
American Economic Review, Vol 67, No 1 (Proceedings of the Eightyninth Annual Meeting of the American Economic Association, Atlantic City, Sept '76), p 333-340, February 1977. 5 fig, 3 tab.

Descriptors: *Environmental control, *Costs, *Benefits, *Population, *Programs, *Economics, Water pollution control, Water treatment, Air pollution, Pollution abatement, Linear programming, Algorithms, Constraints, Optimization, Systems analysis, Taxes.
Identifiers: Income level, Willingness to pay, Cost minimization, Exactions.

Considered is the distribution among segments of the population of the benefits and costs of programs for protecting the environment. Presented

are some indications of how the benefits and costs of the current program impinge on different segments of the population classified by income level. It is urged that the distribution of costs and benefits be accounted for in selecting and designing programs, and a suggestion is given for doing this. Willingness to pay data can be utilized to calculate the area under each of the demand curves derived, and from that one can compute the average willingness to pay for families in the corresponding income bracket. It is desirable in planning such programs to consider ways of minimizing the amount of redistribution of income which is entailed. Discussed is the problem of figuring out which segments of the population will suffer exactions and which will not. A cost minimizing problem must be solved in which linear programming is used to minimize total exaction from the designated segments, and the constraints are the usual ones plus the requirements that no exactions be imposed on the protected segments and that exactions from designated segments be non-negative. It is concluded that this nation must reconcile itself to highly regressive methods for reducing atmospheric pollution and must redouble its efforts to compensate for them by using methods with progressive incidences for water pollution control. (Bell-Cornell)
W77-08870

AN EXAMINATION OF SOME PHYSICAL AND BIOLOGICAL IMPACTS OF DREDGING IN ESTUARIES,
Oregon State Univ., Corvallis. School of Engineering; and Oregon State Univ., Corvallis. School of Oceanography.
For primary bibliographic entry see Field 5C.
W77-08918

EFFECTS OF STREAM CHANNELIZATION ON BOTTOMLAND AND SWAMP FOREST ECOSYSTEMS,
North Carolina State Univ. at Raleigh. School of Forest Resources.
For primary bibliographic entry see Field 4A.
W77-08920

PRACTICAL USE OF DECISION THEORY TO ASSESS UNCERTAINTIES ABOUT ACTIONS AFFECTING THE ENVIRONMENT,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources; and Arizona Univ., Tucson. Dept. of Systems and Industrial Engineering.
L. Duckstein, M. Fogel, D. Davis, and J. Weber.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 011, Price codes: A03 in paper copy, A01 in microfiche. Completion Report, February 1977. 41 p, 2 fig, 27 ref, 3 append. OWRT B-043-ARIZ(16), 14-31-0001-5056.

Descriptors: *Environment, *Risks, Decision making, Evaluation, Environmental effects, Model studies.
Identifiers: *Decision theory, *Bayesian statistics, Systems theory, Case study, *Environmental impact statement, *Indentification of uncertainties, *Multiobjective system framework.

The determination of the environmental impact of man's action has many uncertain components. A conceptual framework has been developed to assess the effect of uncertainty on environmental impact statements. A multiobjective system framework utilizing Bayesian decision Theory was developed as a result of the research. As a result salient feature of an Environmental Impact Statement that properly considers uncertainty are given. Decision theory can be used to advantage in aplying this methodology to assess the effect of natural and informational uncerainty. Even the complexity of computational procedures involving a Bayes analysis can be overcome by use of approximations or by simulation. Multiobjective decision making models are necessary to analyze the non-commensurate objectives found in studying environmental impact. Current procedures used to assess environmental impact do not take proper cognizance of uncertainty and the problems of trade off among multiple objectives in the analysis and evaluation of actions affecting the environment. Some scientific and legal concepts such as proof and model validation must be thought of in terms of probability, if optimal decisions are to be made affecting our future environment. The methodology developed by this project shows how uncertain information and scientific models can be used to advantage in planning the future.
W77-08927

TRAP RESPONSES OF THE GRAY SQUIRREL (SCIURUS CAROLINENSIS CAROLINENSIS), RACCOON (PROCYON LOTOR LOTOR), AND OPOSSUM (DIDELPHIS VIRGINIANA VIRGINIANA) TO ENVIRONMENTAL FACTORS IN TWO SWAMP WATERSHEDS OF NORTHEASTERN NORTH CAROLINA,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
H. R. Perry, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 998, Price codes: A10 in paper copy, A01 in microfiche. Ph.D. Thesis, 1974. 189 p, 85 fig, 8 tab, 79 ref, append. OWRT B-049-NC(3). 14-31-0001-3626.

Descriptors: *Surveys, Wetlands, Swamps, *Wildlife habitats, *Trapping, *North Carolina, Channeling, Watershed management.
Identifiers: Prechannelization, Unchannelized swamp, Climatological variables, *Trap responses, *Gray squirrel, *Opossum, *Raccoon.

This study represented one part of a prechannelization analysis to assess the effects of stream channelization and wetland drainage on fish and wildlife. The objectives were to identify and quantify some environmental factors that are associated with trap responses of the gray squirrel, raccoon, and opossum relative to age, sex, and capture status. Fifteen climatological variables and 51 physical factors dealing with trap site location were studied during the summer and winter of 1972 and 1973. Evaluations were made utilizing standardized trap lines in two unchannelized swamp watersheds in northeastern North Carolina. High intrinsic variability characterized trap response, although most regression models did not suffer from lack of fit. Adjustments for environmental variation may be required to obtain accurate mark-recapture population statistics for squirrels, raccoons, and opossums, especially when comparing different habitats or areas. (See also W75-09130) (Stewart-NC State)
W77-08936

BISCAYNE BAY SYMPOSIUM II,
Miami Univ., Fla. Sea Grant Institutional Program.
For primary bibliographic entry see Field 5G.
W77-08961

SITE EVALUATION AND PRECONSTRUCTION TESTING AT POTENTIAL DEEPWATER PORT LOCATIONS.
Coast Guard, Washington, D. C.
For primary bibliographic entry see Field 6E.
W77-08989

HOMEOWNERS EMERGENCY LIFE PROTECTION COMMITTEE V. LYNN (ENJOINING OF MAJOR FEDERAL ACTIVITY WITH ALLEGED INADEQUATE ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 6E.
W77-09003

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2L.
W77-09037

ENERGY PLANT SITING LEGISLATION,
Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6E.
W77-09050

EFFECTS OF ECONOMIC DEVELOPMENT ON WATER RESOURCES,
Maryland Univ., College Park. Dept. of Economics.
For primary bibliographic entry see Field 5G.
W77-09051

ECONOMIC DEVELOPMENT AND ENVIRONMENTAL QUALITY IN THE NORTHEASTERN PLATEAU REGION OF CALIFORNIA,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W77-09055

STUDIES OF THE FISH POPULATIONS IN TWO EASTERN NORTH CAROLINA SWAMP STREAMS,
North Carolina State Univ. at Raleigh. Dept. of Zoology.
For primary bibliographic entry see Field 2I.
W77-09062

7. RESOURCES DATA

7A. Network Design

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 7C.
W77-08610

EVAPORATION FROM SEVEN RESERVOIRS IN THE DENVER WATER-SUPPLY SYSTEM, CENTRAL COLORADO,
Geological Survey, Reston, Va. Water Resource Div.; and Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 2D.
W77-08736

7B. Data Acquisition

GEOPHYSICAL EXPLORATION FOR POTABLE GROUNDWATER SUPPLIES IN THE KALAHARI GEMSBOK NATIONAL PARK,
Ruker (Richard) and Associates, Bryanston (South Africa).
For primary bibliographic entry see Field 4B.
W77-08654

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
For primary bibliographic entry see Field 8G.
W77-08668

TIME-OF-TRAVEL STUDY, BLACK RIVER FROM LYONS FALLS TO DEXTER, NEW YORK,
Geological Survey, Albany, N. Y. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-08747

PALEOHYDROLOGIC PHENOMENA RECORDED BY LAKE SEDIMENTS,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 2J.
W77-08750

REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO,
Geological Survey, Reston, Va. Water Resources Div.
E. J. Pluhowski.
Meeting Preprint 2602 presented at the American Society of Civil Engineers National Convention, held in Denver, Colorado, November 3-7, 1975. 28 p, 13 fig, 6 ref.

Descriptors: *Turbidity currents, *Lake Ontario, *Remote sensing, *Satellites(Artificial), *Photography, Littoral drift, Sediments, Thermal stratification.
Identifiers: *LANDSAT images, *Turbidity plumes, Thermal bar.

Space imagery and high-altitude photography provide an effective method of monitoring the dynamics of turbidity plumes in Lake Ontario. The Niagara River plume, as much as 200 square miles (518 sq km) in area, is by far the largest turbidity feature in the lake. Plume analyses corroborate the presence of a prevailing eastward flowing longshore current along the entire south shore of the lake. This current is most persistent at the Oswego River outlet but is quite variable in the Rochester embayment, where rapid shifts in water movement were detected occasionally in LANDSAT images. The position of the spring thermal bar, a zone of maximum density water corresponding to the 4 deg C isotherm, was located near the Niagara River outlet in images obtained during April 1973. (Woodard-USGS)
W77-08752

A PNEUMATIC DOSING APPARATUS FOR FLOW-THROUGH BIOASSAYS,
Lakehead Univ., Thunder Bay (Ontario). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W77-08763

A COMPARISON OF METHODS OF HYDROCARBON ANALYSIS OF MARINE BIOTA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 5A.
W77-08789

AUXILIARY AIR SYSTEM FOR USE IN LABORATORY EXPERIMENTS,
National Marine Fisheries Service, Seattle, Wash. Northwest Fisheries Center.
E. F. Prentice, and K. X. Gores.
The Progressive Fish Culturist, Vol 39, No 2, p 61, April 1977. 1 fig.

Descriptors: *Aquiculture, Methodology, *Laboratory equipment, *Fish hatcheries, Fish farming, *Fish handling facilities, Water quality, *Aeration, Laboratories.
Identifiers: *Auxiliary air system, *Laboratory emergencies, Aquaculture marine station, Manchester, Washington, Scuba air system, *Power failure.

An emergency air system was developed to provide aeration to the laboratories holding facility in the event of a power failure. It is (1) a reliable emergency air supply for a small laboratory, (2) low cost, (3) total automation, (4) operability in areas where internal combustion engines are not practical. (Katz)
W77-08800

NEW SAMPLER FOR SHALLOW-WATER BENTHIC MACROINVERTEBRATES,
Heidelberg Coll. Tiffin, Ohio. River Studies Lab.
B. L. Prater, D. R. Barton, and J. H. Olive.
The Progressive Fish Culturist, Vol 39, No 2, p 57-58, April 1977. 1 fig, 16 ref.

Descriptors: On-site investigation, *Methodology, *Benthic fauna, Benthos, *Sampling, Monitoring, Invertebrates, Investigations, Animal populations, *Depth, Shallow water, Ohio.
Identifiers: *Sampler, Macroinvertebrates, *Benthic macroinvertebrates, *Shallow-water organisms, Quantitative samplers, *Scioto River basin(Ohio), Field equipment.

A sampler has been developed to quantitatively sample aquatic macroinvertebrates in shallow bodies of water. The construction allows an investigator to sample virtually any type of substrate except rock. (Katz)
W77-08801

CURRENT-METER RECORDINGS OF LOW-SPEED TURBIDITY CURRENTS,
Scripps Institution of Oceanography, La Jolla, Calif. Geological Research Div.
For primary bibliographic entry see Field 2L.
W77-08847

WAVE HEIGHT MEASURING DEVICE,
Texaco Inc., New York.
G. E. Mott, and R. L. Skaggs.
U.S. Patent No. 4,000,646, 4 p, 6 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 145, January 4, 1977.

Descriptors: *Patents, *Oceanography, *Waves(Water), Ocean waves, Measurement, Monitoring, Instruments.
Identifiers: *Wave height measurement, Wave period.

A wave measuring instrument is used on a dynamically positioned or tethered floating vessel to continuously monitor wave height, wave period and vertical heave of the vessel as the vessel responds to waves, swell and currents. The instrument comprises a measuring device connected to the vessel hull in a submerged position to continuously record the distance between the instrument and the ocean floor as the vessel heaves. A second measuring device automatically gauges and records the normally varying distance between the instrument and the water's surface, which distance results from the usual presence of wave action whether the latter be gradually rolling or relatively turbulent. The respective measurements thus obtained are thereafter integrated and compensated for to provide a relatively accurate record of the actual wave height between trough and crest, the wave period, and the vertical movement or heave of the vessel. (Sinha-OEIS)
W77-08897

HIGH SENSITIVITY FLOWMETER,
Office of the Secretary (Navy), Washington, D.C.
J. R. Olson.
U.S. Patent No. 4,000,648, 7 p, 12 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 146, January 4, 1977.

Descriptors: *Patents, *Oceanography, *Ocean currents, *Ocean circulation, Measurement, Instrumentation.
Identifiers: Sensors, Electromagnetic flowmeters.

This invention utilizes spaced electrodes which are located in an electromagnetic field generated by an elongated electromagnetic coil. This elongated coil by reducing the area within the coil provides a relatively strong field for the amount of the electrical current to excite the coil and the configuration has resulted in sufficient uniformity to provide satisfactory sensitivity such that oceanographic flowmeters may be included in oceanographic station-keeping buoys. Additionally, a method of coil winding and construction has permitted the sharing of mutually perpendicular sensors within a common electromagnetic field. This construction has resulted in an instrument sensor with improved sensitivity over known electromagnetic types and requires only a modest amount of electrical power for energization. (Sinha-OEIS)
W77-08898

TESTING OF A TECHNIQUE FOR REMOTELY MEASURING WATER SALINITY IN AN ESTUARINE ENVIRONMENT,
National Aeronautics and Space Administration, Bay Saint Louis, Mo. Earth Resources Lab.
For primary bibliographic entry see Field 2L.
W77-08903

COMPARISON OF REMOTELY SENSED CONTINENTAL-SHELF WAVE SPECTRA WITH SPECTRA COMPUTED BY USING A WAVE REFRACTION COMPUTER MODEL,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08911

WAVE REFRACTION DIAGRAMS FOR THE BALTIMORE CANYON REGION OF THE MID-ATLANTIC CONTINENTAL SHELF COMPUTED BY USING THREE BOTTOM TOPOGRAPHY APPROXIMATION TECHNIQUES,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W77-08912

PROBLEMS OF OPTIMUM SOIL MOISTURE LEVEL: DETERMINATION AND CONTROL, (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 2G.
W77-08952

ESTIMATION OF WINDS OVER THE GREAT LAKES,
Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.
For primary bibliographic entry see Field 2H.
W77-09022

A REVIEW OF VELOCITY-MEASURING DEVICES,
Geological Survey, Reston, Va. Water Resources Div.
G. F. Smoot.
Open-file report, April 1974. 35 p, 11 fig.

Descriptors: *Current meters, *Discharge measurement, *Flow rates, *Stream gages, *Instrumentation, Evaluatiop, Reviews, Equipment, Rotating meters, *Velocity.
Identifiers: Drag body current meters, Optical current meter, Deep water isotopic current analyzer, Thermo-velocity meters, Eddy-shedding current meter, Acoustic velocity meter, Doppler-shift velocity meter, Electromagnetic current meters, Rotating-element current meters.

In hydrology the list of velocity-measuring devices is quite large and still growing. A complete discussion of all the various instruments that have been accepted for use over the years or that are

presently being developed to measure the velocity of water is not within the scope of this paper. However, this discussion should provide an understanding of the operating principles and the usefulness of the more important instruments or measuring systems which have already been accepted or which hold great promise. The velocity-measuring instruments discussed range from the relatively simple but quite important mechanical devices such as rotating element current meters and deflection vanes to the highly sophisticated electrical systems such as the electromagnetic and the ultrasonic flow meters. Optical, drag-body, thermo-velocity, eddy-shedding, and doppler-shift current meters, as well as the deep water isotopic current analyzer, are discussed also. The discussion focuses on the principle of operation of each measuring device; on the advantages and disadvantages of its use, either as a general field instrument or in special applications; and on any special problems that still need to be resolved before the potential usefulness of these devices can be fully exploited. (Woodard-USGS)
W77-09085

7C. Evaluation, Processing and Publication

DEVELOPMENT OF A HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 792, Price codes: A03 in paper copy, A01 in microfiche. Paper presented at 1975 Annual Meeting ASCE, University of Cal., Davis, June 22-25, 1975. 28 p, 1 fig, 6 ref. OWRT A-067-NC(2). 14-31-0001-5033.

Descriptors: *Computer programs, Data storage and retrieval, Climatic data, Storage, Streamflow, Rainfall, Temperature, Hydrologic data, *Information retrieval.
Identifiers: *HISARS, *Hydrologic Information Storage and Retrieval System.

Modellers often find that a substantial part of their time is taken up assembling data, storing it in a computer accessible form and retrieving it as required. Faced with these problems, a computer system for storage, retrieval, and processing of hydrologic, climatological, and related data has been developed at North Carolina State University. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). System characteristics and capabilities are outlined. Data stored in the system include daily streamflow records, daily rainfall records, daily temperature records, hydrographic records of streamflow and rainfall, hourly rainfall records, daily evaporation and wind movement records, daily snowfall and snow depth records, daily event ('days with') records, annual flood peak records, dam characteristics, environmental resources, and water temperature records (evaporation pans). (See also W77-08610 and W75-03316) (Stewart-NC State)
W77-08609

HISARS - HYDROLOGIC INFORMATION STORAGE AND RETRIEVAL SYSTEM - REFERENCE MANUAL,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
E. H. Wiser.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 802, Price codes: A11 in paper copy, A01 in microfiche. Tech. Bulletin No 215, June 1975. 218 p, 40 fig, 4 append. OWRT A-067-NC(3). 14-31-0001-5033.

Descriptors: Computer programs, *Hydrologic data, Streamflow, Rainfall, Temperature, *Climatic data, *Data storage and retrieval, *Information retrieval.
Identifiers: *HISARS, *Hydrologic Information Storage and Retrieval System(Manual).

A computerized system for storage, retrieval and routine processing of hydrologic data has been developed at North Carolina State University. The system is known as HISARS (Hydrologic Information Storage and Retrieval System). HISARS has been under development for several years, the first version having been operative in July 1969. Although additional features of the system are planned, it is believed that the current version will be useful for a large number of potential users, and this manual is prepared with the intention of making the system more widely available. The system is running on the IBM System/370 Model 165 computer at the Triangle Universities Computation Center, and can be used at any of the remote terminals scattered around the state. Data are stored on magnetic disk packs. By making use of an operating system feature known as the indexed sequential access method together with direct access capabilities of the PL/1 language, HISARS can retrieve any one of approximately 600,000 records directly. This makes it possible to determine weather or streamflow characteristics at any location and at any time for which data are available. It is also possible to compare different locations at the same time and to process records through time at a single location. The following data are now stored by the system: (1) Daily streamflow records; (2) Daily rainfall records; (3) Daily temperature records; (4) Hydrographic records of streamflow and rainfall; (5) Hourly rainfall records; (6) Daily evaporation and wind movement records; (7) Daily snowfall and snow depth records; (8) Daily event ('days with' records; (9) Flood peak records; (10) Dam characteristics; (11) Environmental resources. (See also W77-08609 and W75-03316) (Stewart-NC State)
W77-08610

FLOOD PLAIN INFORMATION: ALBUQUERQUE ARROYAS, PART V, ALBUQUERQUE, NEW MEXICO.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08611

SPECIAL FLOOD HAZARD INFORMATION: ARKANSAS RIVER, FORT DODGE - WILROADS GARDENS, VICINITY OF DODGE CITY, KANSAS.
Army Engineer District, Albuquerque, New Mex.
For primary bibliographic entry see Field 4A.
W77-08612

SPECIAL FLOOD HAZARD INFORMATION REPORT: MISSOURI AND KANSAS RIVERS, KANSAS CITY, KANSAS.
Army Engineer District, Kansas City, Kans.
For primary bibliographic entry see Field 4A.
W77-08613

FLOOD PLAIN INFORMATION: OHIO RIVER, LAWRENCE COUNTY, OHIO.
Army Engineer District, Huntington, W. Va.
For primary bibliographic entry see Field 4A.
W77-08614

FLOOD PLAIN INFORMATION: ASHUELOT RIVER, CITY OF KEENE, NEW HAMPSHIRE.
Army Engineer District, Waltham, Mass. New England Div.
For primary bibliographic entry see Field 4A.
W77-08615

SPECIAL FLOOD HAZARD REPORT: BUFFALO CREEK, MEADOW GROVE, NEBRASKA.
Army Engineer District, Omaha, Nebr.
For primary bibliographic entry see Field 4A.
W77-08616

FLOOD PLAIN INFORMATION REPORT, INDIAN AND DRY CREEKS, LINN COUNTY, IOWA.
Army Engineer District, Rock Island, Ill.
For primary bibliographic entry see Field 4A.
W77-08617

FLOOD HAZARD INFORMATION: YAMPA RIVER AND TRIBUTARIES, STEAMBOAT SPRINGS, COLORADO.
Army Engineer District, Sacramento, Calif.
For primary bibliographic entry see Field 4A.
W77-08619

FLOOD PLAIN INFORMATION: LLAGAS CREEK UNIT I, INCLUDING EDMUNDSON (LITTLE LLAGAS), CHURCH, SAN MARTIN, NEW, CENTER, CORRALITOS, TENNANT, MAPLE, AND FOOTHILL CREEKS, SANTA CLARA COUNTY, CALIFORNIA.
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W77-08620

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 8B.
W77-08622

AN EVALUATION OF THE NATIONAL EUTROPHICATION SURVEY DATA,
National Eutrophication Survey, Corvallis, Oreg.
For primary bibliographic entry see Field 5C.
W77-08710

MAKE MONEY BY COMPUTER,
For primary bibliographic entry see Field 5D.
W77-08730

ANNUAL SUMMARY OF GROUND-WATER CONDITIONS IN ARIZONA, SPRING 1975 TO SPRING 1976,
Geological Survey, Tucson, Ariz. Water Resources Div.
H. M. Babcock.
Water-Resources Investigations 77-10, (open-file report), January 1977. 2 sheets, 20 ref.

Descriptors: *Groundwater resources, *Water utilization, *Irrigation, *Water level fluctuations, *Arizona, Pumping, Drawdown, Aquifers, Water wells, Groundwater availability, *Maps, Evaluation.

Two small-scale maps of Arizona show (1) pumpage of ground water by areas and (2) the status of the ground-water inventory in the State. A larger map of the State at a scale of 1:500,000 shows potential well production, depth to water in selected wells in spring 1976, and change in water level in selected wells from 1971 to 1976. The brief text that accompanies the maps summarizes the current ground-water conditions in the State. The withdrawal of ground water in Arizona was about 5.6 million acre-feet in 1975, of which about 4.7 million acre-feet was used for the irrigation of crops. The Salt River Valley and the lower Santa Cruz basin are the largest agricultural areas in the State. For 1971-75, ground-water withdrawal in the two areas was about 8.3 and 4.7 million acre-feet, respectively, and, in general, water levels are declining. Other areas in which ground-water withdrawals have caused large water-level declines are the Willcox, San Simon, upper Santa Cruz, Avra Valley, Gila Bend, Harquahala Plains, and McMullen Valley areas. (Woodard-USGS)
W77-08732

AVAILABILITY OF GROUND WATER IN THE MIDDLE MERRIMACK RIVER BASIN, CENTRAL AND SOUTHERN NEW HAMPSHIRE,
Geological Survey, Concord, N. H. Water Resources Div.
J. E. Cotton.
Water-Resources Investigations 76-39 (open-file report), 1976. 1 sheet, 3 ref.

Descriptors: *Groundwater resources, *Groundwater availability, *Aquifer characteristics, *Water quality, *New Hampshire, Water yield, Water supply, Geologic mapping, Hydrogeology, Planning, Water utilization, Land use, *Maps.
Identifiers: *Middle Merrimack River basin(NH).

Sufficient amounts of water to supply single family homes are available from the bedrock aquifer nearly everywhere in the middle Merrimack River basin in central and southern New Hampshire. Relatively this and narrow, unconsolidated aquifers of sand or sand and gravel commonly capable of yielding more than 200 gallons per minute to properly located and constructed wells are found only in major stream valleys. The map provides a preliminary assessment of the availability of ground water in the basin, as determined by estimating the capability of the aquifers to store and transmit water. On the map, aquifers are rated as having high, medium, or low potential to yield water. Ground water in the middle Merrimack River basin is generally of good chemical quality. Most of it is clear and colorless, contains no suspended matter and practically no bacteria, water may be affected by land-use practices. Degradation of water quality may occur in unsewered residential and village areas, near solid-waste-disposal sites, agricultural land, and major highways. (Woodard-USGS)
W77-08733

RECORDS OF WELLS, WATER-LEVEL MEASUREMENTS, AND DRILLERS' LOGS, RED RIVER VALLEY, LOUISIANA,
Geological Survey, Little Rock, Ark. Water Resources Div.
J. W. Stephens.
Open-file report 76-759, October 1976. 335 p, 1 fig, 10 plates, 30 tab, 1 ref.

Descriptors: *Water wells, *Water levels, *Well data, *Drillers logs, *Louisiana, Aquifers, Basic data collections, Water utilization, *Data collections.
Identifiers: *Red River Valley(La).

This report is a compilation of hydrogeologic data collected through June 1975 as part of the Red River Waterways project in Louisiana. The study was made by the U.S. Geological Survey in cooperation with the U.S. Army Corps of Engineers, New Orleans District, and the U.S. Soil Conservation Service, Alexandria, La. Included are records of 332 wells and test holes, water levels in 324 wells, and drillers' logs of 316 wells and test holes. Most of the data were collected between July 1968 and June 1975. Well locations are shown. All altitudes given in the tables are referenced to mean sea level. (Woodard-USGS)
W77-08734

WATER RESOURCES DATA FOR WASHINGTON, WATER YEAR 1975.
Geological Survey, Tacoma, Wash. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 197, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report WA-75-1, August 1976. 684 p, 6 fig, 33 ref.

Descriptors: *Washington, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(Wash).

Water resources data for the 1975 water year for Washington, consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality in wells and springs. This report contains discharge records for 250 gaging stations; stage only records for 3 gaging stations; stage and contents for 55 lakes and reservoirs; water quality for 124 stations, 27 lakes, and 35 wells; and water levels for 109 observation wells. Also included are 214 crest-stage partial-record stations. Additional water data were collected at various sites, bot part of the systematic data collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Washington. (Woodard-USGS)
W77-08737

WATER RESOURCES DATA FOR MONTANA, WATER YEAR 1975.
Geological Survey, Helena, Mont. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 198, Price codes: A99 in paper copy, A01 in microfiche. Water-Data Report MT-75-1, August 1976. 604 p, 10 fig, 8 tab, 32 ref.

Descriptors: *Montana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(Mont).

Water resources data for the 1975 water year for Montana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 213 gaging stations; stage only records for 1 lake station; stage and contents for 9 lakes and reservoirs; water quality for 85 gaging stations, 4 lakes; water levels for 18 observation wells. Also included are 219 crest-stage partial-record stations and 53 smaller reservoirs. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Montana. (Woodard-USGS)
W77-08738

WATER-LEVEL CHANGES IN NORTHWESTERN KANSAS, 1950-76,
Geological Survey, Lawrence, Kans. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-08742

SOME COMPUTATIONAL ASPECTS OF ONE- AND TWO-DIMENSIONAL UNSTEADY FLOW SIMULATION BY THE METHOD OF CHARACTERISTICS,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 2E.
W77-08745

GROUND-WATER DATA FOR MICHIGAN, 1975,
Geological Survey, Lansing, Mich. Water Resources Div.
G. C. Huffman.
Michigan Geological Survey Department of Natural Resources, Lansing, 1976. 56 p, 25 fig, 2 tab, 112 ref.

Descriptors: *Groundwater resources, *Water level fluctuations, *Observation wells, *Pumping, *Michigan, Water quality, Water users, Aquifer characteristics, Water yield, Well data, Hydrographs.

This report summarizes data on ground-water levels in 172 observation wells in Michigan, and provides information on well locations, depths, elevations, and aquifers that they tap. Tabulated data include extremes of water levels for 1975 and for the period of record. Also tabulated is the pumpage of most major ground-water users in the State. During 1975, ground-water levels were generally above average in most areas of the State. The high levels are attributed to near or above precipitation for the fourth consecutive year. During the year water levels reached record highs in 22 wells and dropped to record lows in 6 wells. (Woodard-USGS)
W77-08753

INDIANA STREAM-TEMPERATURE CHARACTERISTICS,
Geological Survey, Indianapolis, Ind. Water Resources Div.
W. J. Shampine.
Available from the National Techical Information Service, Springfield, VA 22161 as PB-265 346, Price codes: A04 in paper copy, A01 in microfiche. Water-Resources Investigations 77-6, March 1977. 55 p, 6 fig, 7 tab, 23 ref.

Descriptors: *Water temperature, *Streams, *Indiana, *Computer programs, Forecasting, Methodology, Regression analysis, Fourier analysis, Statistical methods, Data processing, Thermal powerplants, *Data collections.
Identifiers: *Thermal studies, Wabash River(Ind), White River(Ind).

Periodic stream-temperature data collected at 280 different sites in Indiana by the U.S. Geological Survey and the Indiana State Board of Health were analyzed by a simple harmonic-curve-fitting procedure. Calculated harmonic coefficients were related to 23 topographic, basin, and climatic characteristics, and were analzyed by multiple-regression analysis techniques. The mean temperature of the White River at Indianapolis was raised 3.5 deg C above expected ambient levels caused by climatic conditions alone, primarily as a result of discharges from powerplants. In general, the harmonic coefficients depicting annual variability in stream temperatures generated from the Indiana State Board of Health data, collected every 2 weeks, are the same as coefficients generated from the U.S. Geological Survey data, collected every 4-6 weeks. (Woodard-USGS)
W77-08755

COMPILATION OF TEMPERATURE PREFERENCE DATA,
Oak Ridge National Lab., Tenn.
C. C. Coutant.
Journal of the Fisheries Research Board of Canada Vol. 34, p. 739-745, 1977. 1 tab., 75 ref.

Descriptors: *Data collections, Fresh water fish, Marine fish, Juvenile fish, *Fish physiology, *Fish behavior, *Thermal pollution, Water pollution effects, *Temperature, Ecological distribution, Habitats, Reviews, Laboratory tests, *Bibliographies.
Identifiers: *Temperature preference data, *Selection, *Preferendum, Avoidance preferences, Orientation.

This report briefly summarizes current information from field and laboratory studies on temperature selection by fishes, with a tabulation of final temperature preferenda and upper and lower

avoidance temperatures. Data are given on 124 species of marine and fresh water fish. Material presented in tabular form includes species, size or age of fish observed, upper avoidance temperature, final preferendum, lower avoidance temperature, geographical local and literature reference. (Katz)
W77-08767

ENVIRONMENTAL PLANNING FOR AN ALASKAN WATER-ORIENTED RECREATION AREA,
Alaska Univ., College. Inst. of Water Resources.
For primary bibliographic entry see Field 6B.
W77-08805

OBSERVATION RECORDS OF GROUND WATER LEVEL, (IN JAPANESE),
Geological Survey of Japan, Kawasaki.
For primary bibliographic entry see Field 4B.
W77-08904

ANALYTICAL MODELS FOR THE EVALUATION OF SUPPLEMENTAL AERATION IN TEXAS ESTUARIES,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W77-08917

FINITE ELEMENT SOLUTION OF THE TWO-DIMENSIONAL UNSATURATED FLOW EQUATION,
California Univ., Santa Barbara. Dept. of Mechanical and Environmental Engineering.
For primary bibliographic entry see Field 2G.
W77-08923

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, (PARTS I-III),
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08940

IMPROVED METHODOLOGY FOR DESIGN AND OPERATION OF WATER DISTRIBUTION SYSTEMS, PART IV, PROGRAM DOCUMENTATION,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 4A.
W77-08941

PROTOTYPE SOFTWARE FOR ON-LINE STORAGE FORECASTING SUPPORTED BY LOAD FORECASTING AND REDUCED SYSTEM REPRESENTATION FOR WATER DISTRIBUTION SYSTEMS,
Systems Control, Inc. Palo Alto, Calif.
D. Bree, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 556, Price codes: T06 mag tape. March 1977, mag tape DOI/DF-77/006. Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape.

Descriptors: *Water distribution(Applied), Operations, Computer models, Water demand, Forecasting, Estimating, Water control, Documentation, Methodology, *Computer programs.
Identifiers: *Software, Computer tapes, Punched cards.

Ten computer programs have been used in research in Water System Hourly Demand Forecasting (system wide or by pressure zone), Reduced Representation of Pressure Zone Networks, and on line Storage Forecasting. The programs are prototype FORTRAN code for algorithms that a water utility might desire to implement on an advanced distribution control system. The programs will be usable as they are in an off-line study mode, but will require extensive adaptaton to the individual utility's system and control computer, perhaps including rewriting in another language. The program is written in the FORTRAN programming language for implementation on a UNIVAC 1106/1108 computer using the Exec 8 level operating system. 200K bytes of core storage are required to operate the model. (See also W77-08940 and W77-08941).
W77-08942

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
D. Bree, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 555, Price codes: T05 in Mag tape. March 1977, mag tape DOI/DF-77/007. Source tape is in EBCDIC character set. Tape(s) can be prepared in most standard 7 or 9 track recording modes for one-half inch tape.

Descriptors: *Simulation analysis, *Water distribution(Applied), *Control systems, *Computer programs, *Networks, Model studies, California, *Reservoir operation, Design data, Storage, Municipal water, Pipes, Valves, *Distribution systems.
Identifiers: *Extended period simulation, *Software, San Jose(Calif), Computer tapes, Punched cards.

The WATSIM program simulates the flow of water in water distribution networks consisting of pipes, pumps, pressure reducing valves, one-way valves, reservoirs, storage tanks, and fluctuating loads. It can be used either to solve for instantaneous flow rates in a network, or to simulate the operation of such a network over an extended period (24 plus hours). This simulation includes changes in reservoir or storage tank levels driven by fluctuating demand, and the operation of time or pressure actuated valves. The program is capable of simulating up to a 500 node, 750 line network in its present version, and can be expanded by redimensioning directly proportional to network size. The program is written in the FORTRAN programming language for implementation on a UNIVAC 1106/1108 computer using the Exec 8 level operating system. 200K bytes of core storage are required to operate the model. (See also W74-05533).
W77-08943

URBAN STORMWATER POLLUTANT LOADINGS: A STATISTICAL SUMMARY THROUGH 1972,
URS Co., San Mateo, Calif.
For primary bibliographic entry see Field 5B.
W77-09046

NONLINEAR ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09047

OPTIMAL ESTIMATION IN STREAM QUALITY MODELING,
Kansas State Univ., Manhattan, Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W77-09052

LIMNOLOGICAL INVESTIGATION OF SIX LAKES IN SOUTHEAST ALASKA,
Geological Survey, Anchorage, Alaska. Water Resources Div.; and Alaska Dept. of Fish and Game, Anchorage.
G. A. McCoy, W. W. Wiggins, and A. E. Schmidt.
Water-Resources Investigations 76-122, 1976. 1 sheet, 11 ref.

Descriptors: *Limnology, *Alaska, *Lakes, *Water quality, *Lake morphometry, Lake morphology, Chemical analysis, Water chemistry, Geology, Water temperature, Mixing, Chemical properties, Physical properties, Thermal stratification, Chemical stratification, Nutrients, *Maps.
Identifiers: *Southeast Alaska, Redoubt Lake, Blue Lake, Green Lake, Spurt Point Lake, Swan Lake, Osprey Lake.

Limnological data were collected from six lakes in southeast Alaska in 1974. The data include concentrations of major inorganic constituents, nutrients, selected trace metals, total organic carbon, and chlorophyll. Vertical profiles of specific conductance, temperature, dissolved-oxygen saturation, and pH were drawn. With the exception of Redoubt Lake, all of the lakes are very similar chemically. The small differences in chemical composition probably reflect variations in geology of the drainage basins, altitudes, and morphometric characteristics of the lakes. Productivity is so low in all the lakes that it was not possible to rank the lakes by relative productivity from the reconnaissance sampling. Redoubt Lake is meromictic, but the others are probably holomictic and dimictic. (Woodard-USGS)
W77-09069

HYDROLOGIC RECONNAISSANCE OF THE GEOTHERMAL AREA NEAR KLAMATH FALLS, OREGON, WITH A SECTION ON PRELIMINARY INTERPRETATION OF GEOPHYSICAL DATA,
Geological Survey, Menlo Park, Calif. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09070

FLOOD-PLAIN DELINEATION FOR DIFFICULT RUN BASIN, FAIRFAX COUNTY, VIRGINIA,
Geological Survey, Reston, Va. Water Resources Div.
For primary bibliographic entry see Field 4C.
W77-09071

REPORT ON PRELIMINARY DATA FOR MADISON LIMESTONE TEST WELL NO. 1, NE1/4SE1/4 SEC. 15, T. 57 N., R. 65 W., CROOK COUNTY, WYOMING,
Geological Survey, Lakewood, Colo. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09072

GEOLOGIC DATA FROM TEST DRILLING IN PALM BEACH COUNTY, FLORIDA SINCE 1970,
Geological Survey, Tallahassee, Fla. Water Resources Div.
J. J. Schneider.
Open-file report 76-713, August 1976. 99 p, 3 fig, 1 tab, 2 ref.

Descriptors: *Test wells, *Borehole geophysics, *Groundwater resources, *Lithologic logs, *Hydrogeology, *Florida, Aquifer characteristics, Planning, Land use, Urbanization.
Identifiers: *Palm Beach County(Fla).

Test hole data, in Palm Beach County, Florida, include lithologic logs from 66 test wells and geophysical logs from 54 test wells. The purpose of the study is to provide the geohydrologic infor-

mation needed for water management and land use decisions, with emphasis on the urbanized eastern part of the county and the readily developable area in the central part. (Woodard-USGS)
W77-09073

WATER RESOURCES DATA FOR MISSISSIPPI, WATER YEAR 1975.
Geological Survey, Jackson, Miss. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 659, Price codes: A23 in paper copy, A01 in microfiche. Water-Data Report MS-75-1, May 1976. 528 p, 4 fig, 3 tab, 10 ref.

Descriptors: Mississippi, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Water resources, Gaging stations, Streamflow, Flow rates, Water wells, Water levels, Lakes, Reservoirs, Sampling, Sites, Water analysis, Chemical analysis, Sediments.

Water resources data for the 1975 water year for Mississippi consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of wells. This report contains discharge records for 78 gaging stations; stage records for 15 of these gaging stations; stage only records for 4 gaging stations; contents for 4 lakes and reservoirs; water quality for 13 gaging stations and 72 miscelaneous sites; and water levels for 47 observation wells. Also included are data for 136 crest-stage partial-record stations and stage records for 15 discharge stations for the period October 1971 to September 1974 and for 4 stage-only stations for the period January 1972 to September 1974 and for 4 stage-only collected at various, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U. S. Geological Survey and cooperating state and Federal agencies in Mississippi. (Woodard-USGS)
W77-09074

WATER RESOURCES DATA FOR NORTH DAKOTA, WATER YEAR 1975.
Geological Survey, Bismarck, N. Dak. Water Resources Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 277, Price codes: A19 in paper copy, A01 in microfiche. Water-Data Report ND-75-1, September 1976. 431 p, 3 fig, 2 plates, 4 tab, 32 ref.

Descriptors: *North Dakota, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Sampling, Sites.
Identifiers: Annual State report(ND).

Water resources data for the 1975 water year for North Dakota consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water quality in wells. This report contains discharge records for 146 gaging stations; stage for 13 lakes and reservoirs; water quality for 43 gaging stations, 10 partial-record flow stations, 11 lakes, and 25 wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in North Dakota. (Woodard-USGS)
W77-09075

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA 22092. 1976. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, *Kentucky, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Groundwater, Water quality, Flood plains, Precipitation(Atmospheric), On-site investigations, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program.

Water-resources studies and investigations made in Kentucky during 1976 by the U.S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include collections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data network consists of surface-water stations, groundwater observation wells, and water quality observation sites. Small State maps give a broad picture of variations in some of the hydrologic characteristics pertaining to Kentucky's water resources. A larger map shows the hydrologic data network and investigations in the State. (Woodard-USGS)
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
Available from U.S. Geological Survey, Reston, VA 22092. 1976. 1 sheet.

Descriptors: *Water resources, *Investigations, *Inter-agency cooperation, Wisconsin, Surveys, Planning, Hydrologic data, Basic data collections, Streamflow, Runoff, Groundwater, Water yield, Water quality, On-site investigations, Dissolved solids, Precipitation(Atmospheric), Sediment transport, Bibliographies, Networks, Maps.
Identifiers: *Cooperative water-studies program.

Water-resources studies and investigations made in Wisconsin during 1976 by the U. S. Geological Survey in cooperation with State and local agencies are summarized. A bibliography of selected material concerning these investigations is included. The investigations include colections of basic information through a hydrologic data network, areal hydrologic or interpretative studies, and research projects. The hydrologic data consists of surface-water stations; groundwater observation wells, and water quality observation sites. Small State maps show principal sources of groundwater mean annual precipitation, suspended-sediment yield, average annual runoff, discharge of the principal rivers, and dissolved solids in ground and surface waters. A larger map shows the hydrologic data network and investigations in the state. (Woodard-USGS)
W77-09079

GROUND-WATER RESOURCES AND GEOLOGY OF WALWORTH COUNTY, WISCONSIN,
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 2F.
W77-09081

GROUND-WATER HYDROLOGY OF BERKELEY COUNTY, WEST VIRGINIA,
Geological Survey, Morgantown, W. Va. Water Resources Div.
For primary bibliographic entry see Field 4B.
W77-09083

ANALYSES OF NATIVE WATER, BED MATERIAL, AND ELUTRIATE SAMPLES OF MAJOR LOUISIANA WATER WATERWAYS, 1975,
Geological Survey, Baton Rouge, La. Water Resources Div.
For primary bibliographic entry see Field 5A.
W77-09084

WATER-LEVEL RECORDS FOR THE SAN LUIS VALLEY OF COLORADO, 1973-77,
Geological survey, Lakewood, Colo. Water Resources Div.
R. D. Penley.
Open-file report 77-265, March 1977. 12 p, 2 fig, 1 tab.

Descriptors: *Groundwater resources, *Water wells, *Water levels, *Aquifers, *Water level fluctuations, Basic data collections, Planning, Irrigation, *Colorado.
Identifiers: *San Luis Valley(Colo).

Water-level measurements were made in 122 wells in San Luis Valley, Colo., during January 1977. Changes in water levels from January 1976 to January 1977 ranged from a rise of 10.0 feet (3.0 meters) to a decline of 8.6 feet (2.6 meters) both of which occurred in Costilla County. Measurements for the three preceeding winters are included to illustrate longer term water-levels changes. These data can be used by well owners for planting their irrigation schedules for the next irrigation season and can be used by water managers for developing plans to manage the ground-water resources. (Woodard-USGS)
W77-09088

COMPUTER APPLICATIONS FOR STEP-BACKWATER AND FLOODWAY ANALYSES,
Geological Survey, Bay Saint Louis, Miss. Water Resources Div.
For primary bibliographic entry see Field 4A.
W77-09090

8. ENGINEERING WORKS

8A. Structures

RESEARCH BENEFITS IN WATER RESOURCES CONSTRUCTION,
Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
For primary bibliographic entry see Field 6B.
W77-08858

8B. Hydraulics

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
M. B. Roy.
Available from University Microfilms, Inc., Ann Arbor, Mich., 48106. Order No. 77-1768. PhD Thesis, 1976. 238 p.

Descriptors: *Analytical techniques, *Performance, *Piping, *Culverts, Soil physical properties, Model studies, Construction materials, Soil types, Computer models, Loads(Forces), Computer programs, Simulation analysis.

A simulation model based on the finite element method was developed to analyze the performance of culverts buried in soils. A computer program included curved bar segments with normal, tangential, and rotational degrees of freedom; triangular, isoparametric elements with a curved boundary to fit the pipe shape; three midside nodes which represented soil; and an 'interaction' element to simulate interface between pipe and soil. Nonlinear, anisotropic soil properties were included.

Construction sequences can be simulated and 'no-tension' analysis can be included. The system can be applied to questions of the influence of non-linear soil properties, relative stiffness of pipe and soil, the use of weak materials near the spring line, and construction procedures. Time-dependent soil properties, temporary soil compaction loads, and pipe cracking or yielding were not considered. Only two-dimensional problems transverse to the pipe can be analyzed. The analysis of circular corrugated metal pipe in granular soil showed that the maximum circumferential thrust in pipe depends, primarily, on the pipe diameter and height of the fill, and that it is necessary to determine the non-linear soil properties' effects on culvert performance. Neither construction sequence nor slip at soil-pipe interface were significant when the fill was loaded symmetrically. It was also found that Marston-Spangler soil modulus E' could not be used as a soil parameter for rational predictions of culvert performance. (Collins-FIRL)
W77-08622

THE EFFECT OF SURCHARGING ON DISCHARGE THROUGH A PIPE,
Hydraulics Research Station, Wallingford (England).
P. J. Colyer.
Chartered Municipal Engineer, Vol. 104, No. 4, p 60-62, April, 1977. 3 fig, 4 ref.

Descriptors: *Pipelines, *Flow, *Analytical techniques, Hydraulic models, Hydraulic structures, Performance, Evaluation, Hydraulic engineering, *Drainage, *Hydraulic design, *Storm drains.

A simple method was presented to determine the ratio of pipe discharge under surcharge and pipe-full discharge unaffected by surcharge. This information is useful for the design of drainage systems. Other applications include: determining whether an inadequate pipe should be replaced; assessing drainage system performance under rainfalls higher than design capacity; taking advantage of higher discharge capacities under surcharge in situations with difficult constructional constraints; calculating the effect on capacity of varying tailwater levels; and evaluating the comparative costs of designing for surcharged or non-surcharged conditions. The Darcy equation for flow in pipes was used as the basis of this analysis. The critical factor in increases or decreases of discharge through a surcharged pipe was the ratio of the hydraulic gradient to the pipe slope. (Collins-FIRL)
W77-08644

CEMENT-MUD SPACER SYSTEM IMPROVES ILLINOIS WELLS,
Dow Chemical Co., Los Angeles, Calif. Dowell Div.
For primary bibliographic entry see Field 8F.
W77-08647

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 4B.
W77-08661

AVOIDING THE PERILS OF CAVITATION,
Buffalo Forge Co., N.Y.
For primary bibliographic entry see Field 8C.
W77-08674

TRAP-EFFICIENCY INVESTIGATION BERNALILLO FLOODWATER RETARDING RESERVOIR NO. 1 (PIEDRA LISA ARROYO) NEAR BERNALILLO, NEW MEXICO, WATER YEARS 1956-1974,
Geological Survey, Albuquerque, N. Mex. Water Resources Div.
For primary bibliographic entry see Field 4D.
W77-08741

SURFACE PARTICLE ORBITS IN UNIFORM WAVES,
Liverpool Univ. (England). Dept. of Civil Engineering.
J. R. Chaplin.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12915, p 205-213, May 1977. 5 fig, 7 ref, 2 append.

Descriptors: *Coastal engineering, *Waves(Water), *Model studies, Numerical analysis, Ocean waves, Mathematical models, Wavelength, Hydraulics, Oceans, Velocity, Measurement, Profiles, Gravity waves.
Identifiers: *Velocity measurement, Particle orbits, Surface mass transport.

A numerical method was developed for calculating free-surface particle velocities in steady-state gravity waves of known profile. The method generates a unique solution for the orbit of a particle in the free surface, such that the motion of the particle is compatible with the observed wave profile, wavelength, and surface mass transport velocity and satisfies the dynamic free-surface boundary condition. Velocities of all free-surface particles may be derived from the geometry of the orbit. Velocities computed from the profile of a wave generated in the laboratory were shown to be compatible with simultaneous subsurface velocity measurements by the Laser Doppler Anemometer. The method was proved valuable in calculating impact velocities in wave slamming experiments. In view of the scatter apparent in almost all experimental evaluations of wave force coefficients, it was suggested that the method be applied to check the validity at the free surface of wave theories used in deriving coefficients from measured forces. (Lee-ISWS)
W77-08845

PRESSURE REDUCING VALVES IN PIPE NETWORK ANALYSES,
Utah State Univ., Logan. Dept. of Civil and Environmental Engineering.
R. W. Jeppson, and A. L. Davis.
Journal of the Hydraulics Division, Proceedings of the American Society of Civil Engineers, Vol 102, No HY7, Proceedings paper No. 12252, p 987-1001, July 1976. 5 fig, 4 tab, 12 ref.

Descriptors: *Water distribution(Applied), *Pipes, *Networks, *Computers, *Valves, Hydraulics, Municipal water, Downstream, Equations, Pumping, Reservoirs, Steady flow.
Identifiers: *Pressure reduction, *Waterworks, Municipal engineering, Jacobian matrix, Banding algorithm, Water flow.

The three separate systems of equations that are in common use in solving steady flow problems in pipe networks are described and the method for including pressure reducing valves in each of these systems is given. The emphasis is on use of efficient computer oriented methods. In the method presented, the pressure reducing valves are permitted to operate normally in maintaining a constant downstream pressure, or they are permitted to act as check valves, preventing reverse flow should downstream pressures exceed valve settings. The inclusion of pressure reducing valves as an integral part of the network of pipes, pumps, reservoirs, and minor loss devices causes no appreciable reduction in the performance of computer programs that have been specifically written to carry out the computations for solutions. (Bell-Cornell)
W77-08855

LOAD TRANSFER AND HYDRAULIC FRACTURING IN ZONED DAMS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
F. H. Kulawy, and T. M. Gurtowski.
In: Journal of the Geotechnical Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No GT9, Proceedings paper 12400, p 963-974, September 1976. 6 fig, 5 tab, 13 ref.

Descriptors: *Dams, *Embankments, *Fractures(Geologic), Stability, Reservoirs, Upstream, Analytical techniques, Hydraulics.
Identifiers: *Load transfer, *Zoned embankments, *Fracturing, Mathematical applications, Cracking, Poisson's ratio.

Incremental, nonlinear finite element analyses were conducted for 14 representative zoned dams of differing geometries and material properties to assess the load transfer and potential for cracking by hydraulic fracturing and local overstress. The results of these analyses showed that significant load transfer was observed in all cases; the load transfer was from the core onto the transitions and shells over most of the height, but it was onto the core near the crest. Tis may be a possible mechanism for longitudinal core cracking in the crest. All other factors being equal, the dams which would exhibit the least transverse cracking potential would have flatter side slopes, would exhibit the least transverse cracking potential would have have flatter side slopes, thicker cores, sloping cores, medium dense shells and cores compacted drier than optimum. The effect of variations in the transitions properties and thicknesses, dam height and core slope in sloping core dams was found to be small with regard to cracking potential. (Bell-Cornell)
W77-08857

SEISMIC DESIGN OF LIQUID-STORAGE TANKS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
For primary bibliographic entry see Field 8D.
W77-08859

SINKAGE AND RESISTANCE FOR SHIPS IN CHANNELS,
Kansas Univ., Lawrence. Dept. of Civil Engineering.
J. S. McNown.
Journal of the Waterways, Harbors, and Coastal Engineering Division, Proceedings of the American Society of Civil Engineers, Vol 102, No WW3, Proceedings paper No 12291, p 287-300, August 1976. 7 fig, 19 ref. OWRT A-071-KAN(2).

Descriptors: *Channels, *Barges, *Ships, Resistance, Waterways, Measurement, Equations, Canals, Harbors.
Identifiers: *Sinkage, Trapezoidal channels, Parabolic channels.

Ships moving in restricted water, as in a canal or an inlet to a harbor, sink lower in the water and experience greater resistance than they do in open water. The ship settles more because the velocities induced in the water by the motion of the ship are greater and the elevation of the water surface drops correspondingly. The amount of sinkage depends upon the cross sections of the ship and the channel. The resistance also increases because of the constriction of the return flow around the ship. Two remarkably good approximations are: (1) the sinkage is the change in potential energy required to produce the kinetic energy of the return flow; and (2) the extra power is that needed to pump the amount of water in the return flow from the lower level back to the original level of the quiet water. It is concluded that remarkably good predictions of the increment of power required for barges moving in channels can be made from simple theoretical results. (Bell-Cornell)
W77-08873

MEANS AND METHOD FOR CONTROLLING BEACH AND SANDBAR EROSION,
C. T. Ziegler.

U.S. Patent No. 4,000,619, 4 p, 8 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 954, no 1, p 137, January 4, 1977.

Descriptors: *Patents, *Beaches, *Erosion, *Beach erosion, *Shore protection, Waves(Water), Engineering structures.

The invention provides a means and method wherein a series of porous bags are caused by wave action to fill with sand and collect on the bottom underlying the wave action with the result that the sand is immobilized and a region is established against which additional sand is collected to form a groin-like deposit. The porous bags are open at one end sufficiently to receive sand and are tied at close intervals to a feeder line, one end of which is anchored in the wave area and the other end of which extends to the shore area. The wave action is utilized to draw the bags progressively from the shore area into the wave area and effect a build-up of the deposited bags. By placement of a number of multiple bag and feeder line units, effective erosion control over a side area may be accomplished. (Sinha-OEIS)
W77-08894

REMOTE SEALING OF MINE PASSAGES CONTAINING FLOWING WATER,
Department of the Interior, Washington, D.C. Office of the Secretary.
For primary bibliographic entry see Field 5G.
W77-08896

WATSIM - A FORTRAN PROGRAM FOR 24 HOUR SIMULATION OF FLOWS AND RESERVOIR FLUCTUATIONS IN WATER DISTRIBUTION NETWORKS,
Systems Control, Inc., Palo Alto, Calif.
For primary bibliographic entry see Field 7C.
W77-08943

NUMERICAL SOLUTION FOR FLOW UNDER SLUICE GATES,
Queensland Univ., Brisbane (Australia). Dept. of Civil Engineering.
L. T. Isaacs.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12923, p 473-481, May 1977. 4 fig, 1 tab, 14 ref, 3 append.

Descriptors: *Sluice gates, *Finite element analysis, *Analytical techniques, *Hydraulics, *Boundaries(Surfaces), Methodology, Flow, Radial gates, Numerical analysis, Gravity, Energy equation.
Identifiers: *Cubic curved triangular elements, Gauss-Seidel iteration.

A numerical method, based on finite element techniques, was developed for the analysis of gravity-affected flow under a sluice gate of arbitrary geometry. The analysis started with assumed free surface profile and two-dimensional discharge, which were modified systematically to give the final result. A curved cubic triangular element which gives a good representation of the boundary geometry and velocity field was employed. The results obtained for a vertical and a radial sluice gate compared favorably with results obtained by analytical methods. However, there are differences between experimental and theoretical (N numerical results, mostly attributed to the existence of a boundary layer. (Singh-ISWS)
W77-09012

MEAN BEHAVIOR OF BUOYANT JETS IN A CROSSFLOW
California Inst. of Tech. Pasadena.
S. J. Wright.
Journal of the Hydraulics Divisision, American Society of Civil Engineers, Vol 103, No HY5, Proceedings Paper 12944, p 499-513, May 1977. 10 fig, 2 tab, 11 ref, 1 append.

Descriptors: *Buoyancy, *Waste dilution, *Jets, *Dispersion, *Hydraulics, Flow, Dimensional analysis, Model studies, Froude number, Laboratory tests.
Identifiers: *Plumes, Trajectories, Buoyant jets, *Crossflow.

A model of round buoyant jets discharged normal to an ambient crossflow was presented. The time average behavior of the complex flow was derived by making analogies with simples flows whose behavior is better understood. The jet behavior was analyzed by considering it to be a source of kinematic momentum and buoyancy flux. The model considered four different flow regimes involving different trajectory and dilution relations. Assumptions for the entrainment of ambient fluid were not required. The predictions of the proposed model were compared to results presented by other researchers. Experiments were performed to verify the model for each flow regime. the experimental results were in agreement with the model predictions. (Singh-ISWS)
W77-09013

PRINCIPLES OF GRAPHICAL GRADUALLY VARIED FLOW MODEL,
Waterloo Univ. (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W77-09015

SHORT JET IMPINGEMENT,
Southern Illinois Univ., Carbondale. Dept. of Engineering, Mechanics and Materials.
T. Davanipour, and S. Sami.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 103, No. HY5, Proceedings Paper 12948, p 557-567, May 1977. 16 fig, 13 ref, 1 append.

Descriptors: *Jets, *Turbulence, *Flow, Turbulent flow, Water pressure, Fluid mechanics, Shear stress, Velocity, Hydraulics, Equations, Mathematical studies.
Identifiers: *Jet flow, Impingement, Water speed, Round turbulent jet, Turbulent intensity, Water shear stress.

The characteristics of the velocity and pressure fields of a round turbulent jet impinging onto a plate were studied. Previous studies covered impingement heights that placed the plate in the fully developed flow region of the jet. The present study covered impingement heights between 0 and 20 nozzle radii. Axial and radial variations of velocity and static pressure were determined. Turbulence intensities along the center line within the impingement zone were presented. The energy balance of the mean flow was achieved pointwise along the jet axis within the impingement zone for two different impingement heights (Lee-ISWS)
W77-09016

DRAG AND INERTIA FORCES ON A CYLINDER IN PERIODIC FLOW,
Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
C. J. Garrison, J. B. Field, and M. D. May.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper No. 12913, p 193-204, May 1977. 6 fig, 6 ref, 2 append.

Descriptors: *Drag, *Hydrodynamics, *Reynolds number, *Laboratory tests, Hydraulic models, Piles(Foundations), Offshore Platforms, Analysis, Equations, Mathematical studies.
Identifiers: *Inertia, *Added mass coefficients, Forces, Amplitude, Displacement, Cylinder drag.

Experimental results for the drag and added mass coefficients for a smooth circular cylinder in oscillatory flow were presented. The test results were correlated with the Reynolds number with the ratio of the amplitude of the motion to cylinder diameter as a parameter. The low Reynolds number results of Keulegan and Carpenter were replotted in the same format, and together with the present high Reynolds number, results give a fairly complete picture of the variation of the drag and added mass coefficients with Reynolds number for fixed values of the relative amplitude parameter. The results showed that generally both the added mass and drag coefficients are highly dependent on the Reynolds number as well as the relative amplitude parameter. Above as Reynolds number of about 20,000, the two coefficients become essentially independent of the Reynolds number. (Adams-ISWS)
W77-09017

ADDED MASS OF PILE GROUP,
Delaware Univ., Newark, Dept. of Civil Engineering.
R. J. Gibson, and H. Wang.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 103, No. WW2, Proceedings Paper 12932, p 215-223, May 1977. 10 fig, 3 ref, 2 append.

Descriptors: *Laboratory tests, *Hydrodynamics, *Piles(Foundations), Drag, Coastal structures, Hydraulic models, Structural design, Model studies, Equations, Mathematical studies.
Identifiers: *Pile groups, *Inertia, *Pile spacing, Forces, Wake interference, Blockage, Solidification.

Through laboratory investigation, its was shown that when a pile group is arranged in a cluster, the added mass (or inertial force) increases sharply after the spacing between piles falls below a certain critical value. Two configurations of pile group arrangement-circular and square shapes of approximately the same base diameter-were tested. The experimental results revealed that when the spacing between piles is smaller than two times the pile diameter, or when the solidification ratio becomes larger than 0.5, the added mass of the pile group increases drastically. For pile groups with individual pile spacing less than the critical value, the volume enclosed, rather than the volume displaced, by the pile cluster should be used as bases for added mass computation. (Adams-ISWS)
W77-09018

BEACH SAND TRANSPORT: DISTRIBUTION AND TOTAL DRIFT,
Oregon State Univ., Corvallis. Estuarine and Coastal Research Program.
For primary bibliographic entry see Field 2L.
W77-09019

EFFECT OF SEDIMENT LOAD ON STABLE SAND CANAL DIMENSIONS,
Roorkee Univ. (India), Dept. of Civil Engineering.
K. G. R. Raju, K. R. Dhandapani, and D. M. Kondap.
Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 103, No WW2, Proceedings Paper 12931, p 241-249, May 1977. 4 fig, 2 tab, 6 ref, 2 append.

Descriptors: *Bed load, *Canals, *Sediment load, Cross-sections, Dimensions, Sediments, Sedimentation rates, Stability, Hydraulics, Foreign countries, Foreign research.
Identifiers: *Sediment concentration, *India, Sediment deposits.

An experimental study was done with the object of providing a clear picture of the effect of sediment load on the dimensions of stable canals. The experiments were carried out in a recirculating sand tray at a constant discharge using sand of median size of 0.27 mm. Variation in sediment load was achieved by suitable changes in the initial cross section and slope given to the channel; the

equilibrium sediment concentration could thus be varied from 150 ppm to 2500 ppm by weight. It was found that the final stable cross sectional dimensions of the channel were practically insensitive to sediment concentration, whereas the final slope was strongly dependent on it. It was concluded that relations for cross-sectional dimensions of a stable canal may be evolved ignoring the effect of sediment concentration, but the regime slope ought to be related to the sediment concentration apart from the discharge and sediment size. (Lee-ISWS)
W77-09020

ESTIMATING WAVE GENERATION ON RESTRICTED FETCHES,
California State Dept. of Navigation and Ocean Development, Sacramento; and Scripps Institution of Oceanography, La Jolla, Calif.
For primary bibliographic entry see Field 2L.
W77-09021

THEORETICAL AND EXPERIMENTAL STUDY OF FLOW SEPARATION AFTER A SUDDEN INCREASE IN THE CROSS-SECTION OF A CIRCULAR PIPE (ETUDE THEORIQUE ET EXPERIMENTALE D' UN ECOULEMENT DECOLLE EN AVAL D'UN ELARGISSEMENT BRUSQUE DE REVOLUTION),
Centre National de la Recherche Scientifique, Toulouse (France). Institut de Mecanique des Fluides.
H. M. Hieu, and P. Hebrand.
Journal of Hydraulic Research, Vol. 15, No. 1, p 1-18, 1977. 14 fig, 16 ref.

Descriptors: *Flow separation, *Theoretical analysis, *Laboratory tests, *Hydraulics, Mathematical studies, Flow, Fluid mechanics, Closed conduit flow, Pipe flow, Flow characteristics, Velocity, Distribution, Measurement, Turbulent flow, Flow resistance, Turbulence, Pressure, Energy transfer.
Identifiers: Velocity profiles.

Methods were developed for calculation of mean velocity and pressure and mean turbulent kinetic energy, Reynolds tension, dissipation, etc., in turbulent incompressible flow after separation at a sudden increase in the cross section of a circular duct. One method, based on the concept of effective turbulent viscosity and elliptical equations (because of the recirculation taking place), allowed prediction of flow conditions from the point of separation to that a long way downstream at which normal flow is restored. Another method is associated more especially with the area in which normal flow is restored after readhesion; as the governing equations in this zone are parabolic, it was possible to apply models containing Reynolds stress transport equations without the turbulent viscosity concept. The overall calculated data were compared with experimental results determined on an aerodynamics model used to study the effect of the initial boundary layer, Reynolds number, and the cross-sectional expansion factor. Turbulent kinetic energy and friction transfer mechanisms were described in terms of the results of the comparison between theoretical and experimental data. (Humphreys-ISWS)
W77-09034

RESISTANCE OF TWO DIMENSIONAL TRIANGULAR ROUGHNESS,
Roorkee Univ. (India). Dept. of Civil Engineering.
N. Vittal, K. G. Ranga Raju, and R. J. Garde.
Journal of Hydraulic Research, Vol. 15, No. 1, p 19-36, 1977. 11 fig, 1 tab, 18 ref.

Descriptors: Hydraulics, *Flow resistance, *Shear, *Flumes, *Dunes, Boundaries(Surfaces), Laboratory tests, Calibrations, Data collections, Reynolds number, Dimensional analysis.
Identifiers: *Triangular roughness, *Form drag, Ripples and dunes, Undulating bed.

Measurements of shear and pressure distributions on smooth and sand coated two-dimensional triangular elements, simulating ripples and dunes, were made in a laboratory tilting flume. Relations were drived for the local and average skin shear coefficients in terms of the geometry of the elements and the Reynolds number of flow. The local pressure coefficient and the form drag coefficient were related to the roughness and the geometry of the elements. Analysis of the available data showed that the grain resistance of undulated beds calculated by the presently available methods was generally greater than the measured average grain resistance of the bed. An analysis of the available alluvial channel data indicated that the observed form drag agreed with the form drag of the two-dimensional triangular roughness. (Singh-ISWS)
W77-09035

A MATHEMATICAL MODEL OF STEADY FLOW IN CURVED SHALLOW CHANNELS,
Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering.
H. J. De Vriend.
Journal of Hydraulic Research, Vol. 15, No. 1, p 37-54, 1977.

Descriptors: Hydraulics, *Model studies, *Laboratory tests, *Velocity, *Turbulence, Eddies, Analytical techniques, Interfaces, Mathematics, Shear, *Mathematical models.
Identifiers: *Eddy viscosity, *Curved flow, Perturbation method, Flow distribution.

Starting from a logarithmic main velocity profile, the vertical distribution of the secondary flow in a shallow curved channel was derived. the secondary circulation turned out to have one vertical and two horizontal components. The horizontal component in the main flow direction arises from the longitudinal acceleration of the main flow; the transverse horizontal component is due to the curvature of the main flow. A numerical method for the computation of the depth-averaged flow field and the bed shear stress was developed. The model allows flexibility in channel geometry. The vertical distributions of velocity computed from the model agree satisfactorily with the experimental results of other investigations if the flume or channel bed is not flat. (Singh-ISWS)
W77-09036

THE THIRD LONDON AIRPORT STUDY,
Hydraulics Research Station, Wallingford (England).
For primary bibliographic entry see Field 2L.
W77-09037

ROUGHNESS EFFECTS ON THE FLOW DIRECTION NEAR CURVED STREAM BEDS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik.
C. Zimmermann.
Journal of Hydraulic Research, Vol. 15, No. 1, p 73-85, 1977. 6 fig, 4 tab, 17 ref.

Descriptors: *Shear stress, *Channel flow, *Roughness(Hydraulics), Sediment transport, Roughness coefficient, Alluvial channels, Hydraulics, Equations, Mathematical studies.
Identifiers: *Curved stream beds, Radial shear stress, Channel beds, Bed roughness, Circular channels.

Radial shear stresses on the surface of curved channel beds due to secondary flow increase with increasing bed roughness and affect the direction of flow of sediment particle motion over a channel bed. By means of an analysis, it was shown that flow direction approaches the tangential direction of the flow with increasing bed roughness, while flow over smooth curved channel beds shows a stronger deviation from the tangential direction. Accordingly, fluid or sediment particles moving at a curved channel bed and originating from the outer wall region reach the inner wall much faster in a flow over a smooth bed than over a rough bed. The analytical result was confirmed by experiments in circular planform channels with fixed beds of varying roughness and also by alluvial bed experiments in circular channels. (Lee-ISWS)
W77-09038

FLOW REGIMES IN DEBRIS FLOW,
State Univ. of New York at Binghamton.
For primary bibliographic entry see Field 2J.
W77-09045

8C. Hydraulic Machinery

DRILL STRING MAKEUP, PAST, PRESENT, FUTURE,
J. L. Foster.
Drilling-DCW, Vol. 38, No. 4, p 81-83, 94, February, 1977. 5 fig.

Descriptors: *Joints(Connections), *Steel pipes, *Rotary drilling, Equipment.
Identifiers: *Drill string makeup, Chain tongs, Catheads, Power tongs, Torque.

Early methods of making and breaking drill pipe threaded joints were based on pure physical labor in keeping with the times. Tools used were originally known as early as 1500 a.d., such as the chain tong and the casing pole and rope, with the assistance of a sledge hammer for final tightening. With the general acceptance of the tool joint and the change to eight pitch round threads in the casing and tubing, initial turning to make up joints became a different proposition. In response, use of the cathead with various combinations of catline, forked line, wire line, and chain became the standard methods of spinning pipe. Further mechanization of the joining process was frequently resisted by drilling crew mechanization of the joining process was frequently resisted by drilling crew members afraid of losing their jobs, however, more sophisticated equipment has come into use nonetheless. Power tongs can now be built into rigs that will spin pipe rapidly and will apply sufficient torque without bending the pipe. The need still exists for further research toward faster and safer makeup equipment. (Eberle-NWWA)
W77-08648

RECENT ADVANCES IN ROTARY DRILL BITS,
Smith International, Inc., Irvine, Calif. Smith Tool Div.
For primary bibliographic entry see Field 8G.
W77-08649

TODAY'S WINDMILLS: A BLEND OF OLD AND NEW,
A. B. Stanley.
Water Well Journal, Vol 31, No 4, p 62-63, April, 1977.

Descriptors: *Energy, *Pumping, Winds, Technology, Water supply, Pumps, Turbines, Generators.
Identifiers: *Windmills, Windmill industry.

Far from being a relic of the past, the windmill industry is bigger today than ever and has never ceased to be essential for maintaining America's rural water supply. Windmill technology developed rapidly in the 1800's as deep wells became more feasible and machinery to pump them more necessary. In the peak year of 1929, more than 100 manufactureres of windmills reaped total sales of nearly 10 million dollars. Today the windmill can be used to directly drive a submersible pump. Dr. Bill Hughes of American Wind Turbine, Inc., has developed a system utilizing a 12-foot turbine, tower, generator, and pump which will draw from wells 350 feet deep using wind as

the only power source. It is, admittedly, a relatively expensive way to pump water (8 or 9 cents/kolowatt hour) and the times when no wind is blowing still present a problem, but Hughes is confident that his device will become more competitive as energy prices soar, and that the American windmill will continue to thrive in years to come. (Eberle-NWWA)
W77-08650

GROUND WATER - SOLAR HEAT,
B. Cortell.
Water Well Journal, Vol 31, No 5, p 73, May, 1977.

Descriptors: *Solar radiation, *Energy, *Groundwater, Heating, Aquifers, Energy conversion.
Identifiers: *Heat storage(Energy).

Although solar heating has been with us for many years, the unavailability of energy on cloudy days is a disadvantage that still plagues us. Recent research has been done on the possibility of storing heat in undergound aquifers, a means by which the sun's discontinuous energy could be converted into a constant source. For example, if an artificial controlled well field with dimensions of 50 by 50 by 20 feet were installed in an ordinary building lot and the water temperature raised by 50 degrees F, 156 million BTU's of energy would be stored. Important questions concerning surrounding geological conditions still need to be asked, such as: (1) whether heating stored water will result in higher mineral content and pose a threat to solar collectors and well apparatus, and (2) whether heat transfer from the heat sink to the host formation will be a problem. (Eberle-NWWA)
W77-08652

A CASE FOR GEOTHERMAL ENERGY,
R. M. E. Diamant.
Heating and Ventilating Engineer, Vol 50, No 593, p 10-13, December, 1976. 1 fig, 9 ref.

Descriptors: *Thermal power, *Electric power production, *Electric power costs, Thermal power plants, Capital costs, Thermal water, Heating, *Geothermal studies.
Identifiers: *Great Britain, Crustal temperature gradients.

Although geothermal prospects in the United Kingdom are not obvious at first, such areas as Durham, Cornwall, and parts of the North sea show high thermal gradients of anywhere from 30 to 55 degrees C/km. Ways of exploiting these 'hot rock' areas may be devised in the future, while technology for utilizing thermal waters near the surface already exists to some extent. A recent report of the U.K. Department of Energy has estimated costs of both steam-flashing to drive generators and direct piping of hot water to homes and industry. Expenses involved in geothermal energy conversion are virtually all capital cost and very little operating cost. Overall, thermal power is not uneconomical and it will become more cost-effective if fossil fuel prices continue to rise at the present rate. Using a geothermal plant to provide a minimum base of energy and supplementing with coal or oil fired systems during periods of high demand may be a workable setup for certain areas. (Eberle-NWWA)
W77-08655

WATER TURBINE PUMP FAILURE,
Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
For primary bibliographic entry see Field 8G.
W77-08656

ECONOMICS OF GEOTHERMAL ENERGY DEVELOPMENT (IN IMPERIAL COUNTY, CALIFORNIA),
California Univ., Riverside. Graduate School or Administration.
S. Edmunds.
Energy, Vol 2, No 1, p 25-31, March, 1977. 7 tab, 16 ref.

Descriptors: *Thermal power plants, *Electric power production, *Electric power costs, *Comparative costs, Electric power rates, Capital costs, Construction costs, Manpower, *Geothermal studies, *California, Energy.
Identifiers: *Salton Trough(Calif), *Imperial County(Calif).

Geothermal resources in Imperial County (California) appear to have the potential of developing somewhere between 3000 and 6000 mW of power. By the year 2000, geothermal energy might supply about 4-5 percent of California's total generating capacity at that time. Steam flash technology presently available would appear to produce electricity from thermal sources at competitive costs of 38 mills per kWh or less, somewhat below comparative costs of coal, oil, or nuclear fueled systems. Estimates vary, but the combined field investment costs and generating plant investment are thought to be between 500 and 750 dollars per kWh of capacity for the completed installation, based on 1976 prices. Due to the capital-intensive nature of geothermal energy plant construction and operation and the necessity of shipping much of the equipment from outside the County, impact on the local job market will be relatively small. Local tax revenues, however, would amount to over 1 million dollars annually, and would be a major continuing benefit to Imperial County. (Eberle-NWWA)
W77-08657

PUMPING TESTS PROVIDE USEFUL DATA,
Universal Oil Products, St. Paul, Minn. Johnson Div.
For primary bibliographic entry see Field 8G.
W77-08658

METHODS USED FOR DRILLING WELLS IN THE SOVIET UNION,
Vsesoyuznyi Nauchno-Issledovatelskii Institut Gidrotekhniki i Melioratsii, Moscow (USSR).
N. G. Sapozhnikov.
Johnson Driller's Journal, Vol 49, No 2, p 8-9, March-April, 1977.

Descriptors: *Drilling, *Drilling equipment, *Well screens, *Well casings, Rotary drilling, Drilling fluids, Water supply.
Identifiers: *USSR, Well development, Cable-tool drilling.

In the Soviet Republics, water wells are widely used for the same purposes as in the United States. Although rotary and cable-tool drilling methods are fairly advanced, dug wells are still common for domestic rural water supply. Hydraulic rotary drilling accounts for about 80% of total new wells drilled for all purposes. High-grade bentonite muds are a standard fluid, however, Soviets frequently drill with clear water alone when penetrating fine sand aquifers. Drilling mud with special starch as a component is sometimes used to prevent clay plugging of water-bearing sands. Pipe-base mesh screens are the most common well filter; perforated pipe screens with conical openings are occasionally used for hydrogeological applications. Vibration together with driving is applied in some cases to increase rate and depth of sinking casing by cable-tool methods. Another means of speeding the driving process is to sink the casing through a guide pipe of slightly larger diamter. Mud is injected into the annulus between the casing string and the guide pipe as a lubricant. (Eberle-NWWA)
W77-08659

GEOTHERMAL ENERGY DEVELOPMENT,
Los Alamos Scientific Lab., N. Mex.
For primary bibliographic entry see Field 4B.
W77-08661

ROCK TYPE DECIDES JETTING ECONOMICS,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
A. C. Pols.
Oil and Gas Journal, Vol. 75, No. 6, p 71-75, February 7, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: *Rotary drilling, *Rock properties, *Drilling equipment, Drilling fluids, Laboratory tests.
Identifiers: *Jet drilling, *Laminated rock, Isotropic impermeable rock, Drilling penetration rates.

Laminated rock was expected to show different behavior under jetting conditions than isotropic rock in the study under consideration. Tests showed an unsatisfactory performance for jetting a schist sample with water alone, including highly irregular hole walls. Hole shape improved with the use of a clay/water mud, however, penetration rate remained low. Economic comparison of jetting and conventional drilling techniques indicates that the former is not at all feasible at present for hard, impermeable laminated rock. Jetting is, however, cost-effective for permeable and impermeable isotropic sedimentary rock in cases where conventional drilling costs are high. Hybrid jetting/mechanical bits could possibly prove effective for drilling impermeable formations, but much more research on such tools is necessary. (Eberle-NWWA)
W77-08666

TESTS SHOW JET-DRILLING HARD ROCK POTENTIAL,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 8E.
W77-08667

AIR, MIST AND FOAM DRILLING, A LOOK AT LATEST TECHNIQUES,
R. A. Hook, L. W. Cooper, and B. R. Payne.
World Oil, Vol. 184, No. 5, p 95-103, April, 1977. 6 fig, 3 ref.

Descriptors: *Rotary drilling, *Drilling equipment, Oil wells, Boreholes, Valves.
Identifiers: *Air-rotary drilling, Air-rotary bits, Mist drilling, Foam drilling, Air compressors.

Not only can air drilling techniques reduce drilling time and cut costs, they can also minimize formation damage, prolong bit life, and permit better drilling control in cavernous and lost circulation areas. Their primary disadvantages are poor performance in soft or wet formations. Actual rock removal occurs when the rock face fractures under the weight of the bit and particles are swept out of the hole in the air stream. The bits themselves are generally hard formation insert type roller-cone bits similar to those used in mud drilling. Conversion of a conventional rotary rig to an air drilling operation is relatively simple. Most of the liquid and solids handling equipment is removed, and a valve manifold, air compressor, and booster are added. A rotating drilling head is essential for containing and directing the flow of dust emerging from the hole. Blowout protectors, blooie lines, and other related equipment are added for air drilling for oil or natural gas. (Eberle-NWWA)
W77-08669

LIQUID JET EDUCTORS, THE 'PUMPS' WITH NO MOVING PARTS,
Schutte and Koerting Co., Cornwell Heights, Pa.
H. Stratton.
Plant Engineering, Vol. 123, No. 8, p 215-218, April 29, 1976. 8 fig.

Descriptors: *Pumping, *Hydraulic equipment, *Pumps, Flow, Deep wells, Slurries.
Identifiers: *Liquid jet eductors(Pumps).

Liquid jet eductors are unconventional pumps which operate according to the Bernoulli theorem, i.e., the kinetic energy of one fluid is used to move another fluid. Eductors have no moving parts to wear out, can be made of almost any machineable material, and can be installed in some sorts of remote locations inaccessable to commonly used pumping equipment. Various types of eductors have been designed for mixing or blending, pumping muds and slurries (or even solids), obtaining water from deep wells, and as priming devices for mechanical pumps. Theoretically, maximum performance of eductors can be precisely calculated, however, performance is affected by energy losses associated with mixing the two fluids and by friction losses in the diffuser. (Eberle-NWWA)
W77-08671

SELF-PRESSURIZING SEALS KEEP SUBMERSIBLE MOTORS DRY,
General Electric Co., Schenectady, N.Y.
J. D. McHugh.
Mechanical Engineering, Vol. 98, No. 2, p 20-27, February, 1976. 10 fig, 2 tab, 15 ref.

Descriptors: *Pumps, *Electric motors, *Water wells, *Sealants, Pumping, Electrical design.
Identifiers: *Submersible pumps, *Submersible electric motors, *Electric motor face seals, Pump failure.

For some sorts of water wells, especially deep wells, submersible pumps offer clear advantages. During the early years of pump development and use, however, a small but significant proportion of failures occurred in well installations apparently as a result of water in-pumping around face seals. Three possible causes of water invasion into pump motors were investigated by General Electric: vertical shock during installation, dynamic pressure variations during pumping causing reversed pressures across the seal, and in-pumping at the primary seal surfaces as explained by the theory of eccentric seal operation. Experiments pointed to the latter as the most probable source of trouble. Tests were subsequently run on a new self-pressuring double seal arrangement. The expected advantages of this design were greater protection against water ingress during both pumping and shut down, as well as reduction of wear on primary seal surfaces. Prototype motors showed such excellent performance in all these respects that motors incorporating this design have now been in production for about 4 years. (Eberle-NWWA)
W77-08672

SELECTION OF SLURRY PUMPS FOR SEVERE APPLICATIONS,
Warman International, Inc., Madison, Wis.
R. E. McElvain.
Mining Engineering, Vol. 28, p 26-28, December, 1976. 6 fig, 2 tab.

Descriptors: *Slurries, *Pumps, *Drilling fluids, *Pumping, Flow, Hydraulic design, Hydraulic machinery, Performance.
Identifiers: Pump selection.

As mining and other industries have placed increasing demands on equipment, slurry pumps have thus been developed which can handle greater solids concentrations, higher heads and pressures, and greater flow than pumps of ten years ago. Matching the right pump to its proper application can be done fairly precisely by considering flow-to-resistance relationships and head available against flow resistance. Adjustments usually need to be made in performance curves of slurry pumps to account for slip between fluid and particles as well as higher viscosity of slurry; most performance curves are established for clear water only. The greater the proportion of solids in the slurry mixture, the less the developed head during pumping and the lower the efficiency of the pump. Stable, shock-free flow at a safe carrying velocity is critical for a smoothly operating system and for pump protection. Maintaining slurry of sufficient density is one of the most important ways of keeping a pumping system economical. (Eberle-NWWA)
W77-08673

AVOIDING THE PERILS OF CAVITATION,
Buffalo Forge Co., N.Y.
L. B. Timmerman.
Machine Design, Vol 48, p 99-103, September 23, 1976. 8 fig.

Descriptors: *Pumping, *Damages, *Hydraulic equipment, Pumps, Pipe flow, Fluid friction, Vapor pressure.
Identifiers: *Cavitation, *Net positive suction head(NPSH), Friction losses.

Although the most visible damage from pump cavitation is impeller pitting, the worst damage is actually done to bearings and seals. The extreme, instantaneous, and irregular changes in radial and axial thrust that occur during cavitation cause rapid and uneven pump parts wear. Cavitation can be prevented if the net positive suction head available in a system is greater than the net positive suction head required by the pump. Available head is equal to the sum of atmospheric pressure and static head above the pump minus vapor pressure of the pumped liquid, friction loss from the suction pipe, velocity-head loss, and entrance loss at the pump. It is essential for the pumping system designer to bear in mind that atmospheric pressure fluctuates daily, which can result in occasional cavitation problems should too small a safety margin be allowed. The same holds true for friction loss; deposit build-up on pipe walls can increase friction loss to several times the original manufacturer's specifications as the system ages. (Eberle-NWWA)
W77-08674

PUMP CONSTRUCTION MATERIALS,
Vanton Pump and Equipment Co., Union, N.J.
For primary bibliographic entry see Field 8G.
W77-08675

IRRIGATION DRAIN VALVE,
Ireco Industries, Inc., Eugene, Oreg. (Assignee).
For primary bibliographic entry see Field 3F.
W77-08887

8D. Soil Mechanics

PREDICTING PERFORMANCE OF PIPE CULVERTS BURIED IN SOIL,
Purdue Univ., Lafayette, Ind.
For primary bibliographic entry see Field 8B.
W77-08622

STRENGTH OF SOIL AGGREGATES: INFLUENCE OF SIZE, DENSITY AND CLAY AND ORGANIC MATTER CONTENT,
Agricultural Research Service, University Park, Pa. Northeast Watershed Research Center.
For primary bibliographic entry see Field 2G.
W77-08707

SEEPAGE UNDER STRUCTURE ON N STRATA OF SOIL,
Missouri Univ.-Columbia. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W77-08843

LOAD TRANSFER AND HYDRAULIC FRACTURING IN ZONED DAMS,
Cornell Univ., Ithaca, N. Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 8B.
W77-08857

SEISMIC DESIGN OF LIQUID-STORAGE TANKS,
Connecticut Univ., Storrs. Dept. of Civil Engineering.
H. I. Epstein.
Journal of the Structural Division, Proceedings of the American Society of Civil Engineers, Vol. 102, No. ST9, Proceedings paper No. 12380, p 1659-1673, September 1976. 7 fig, 2 tab, 22 ref.

Descriptors: *Seismic design, *Storage tanks, Water storage, *Earthquakes, Equations.
Identifiers: *Fluid dynamics, *Oil storage, *Tanks(Containers), Sloshing, Containers.

Cylindrical and rectangular flat-bottomed liquid storage tanks subjected to horizontal earthquake excitations are studied. Formulas and curves that can be used to obtain bending and overturning moments are presented. Certain combinations of earthquake response spectra and tank geometries produce maximum forces and moments when the tank is only partially full. The use of design curves in establishing this situation is illustrated. For slender tanks, an assumption made in present design practice is shown to lead to nonconservative results. The elimination of this assumption is shown to produce simplified expressions for the moments in these cases. Simplified expressions are also presented for use in estimating the maximum free surface displacement. (Bell-Cornell)
W77-08859

8E. Rock Mechanics and Geology

LAND SUBSIDENCE,
National Water Well Association, Worthington, Ohio.
For primary bibliographic entry see Field 4B.
W77-08653

FAULT CONTROL OF SUBSIDENCE, HOUSTON, TEXAS,
Texas Univ. at Austin. Bureau of Economic Geology.
For primary bibliographic entry see Field 4B.
W77-08662

ROCK TYPE DECIDES JETTING ECONOMICS,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
For primary bibliographic entry see Field 8C.
W77-08666

TESTS SHOW JET-DRILLING HARD ROCK POTENTIAL,
Koninklijke Shell Exploratie en Productie Laboratorium, Rijswijk (Netherlands).
A. C. Pols.
Oil and Gas Journal, Vol. 75, No. 5, p 134-144, January 31, 1977. 11 fig, 2 tab.

Descriptors: *Rotary drilling, *Rock properties, *Drilling equipment, Drilling fluid, Laboratory tests.
Identifiers: *Jet drilling, *Isotropic impermeable rock, Drilling penetration rates.

Although jet drilling in hard, impermeable rock is much more difficult than in permeable rock, evidence indicates that impermeable isotropic rock can be jet-drilled at higher than conventional drilling rates, perhaps making jet drilling profitable for high daily rig cost ranges. In this study, laboratory test of an experimental jet bit were made on several rock samples placed under high axial load, during which rotary speed, bit torque, fluid pressure before the swivel, ambient pressure, and depth of penetration were recorded as variables. Generally, penetration rate increased slowly with increasing bit-pressure drop (on the order of 10 millimeters/min. per megapascal), penetration rate

decreased with increased mud density, and rotary speed had little effect on the isotropic impermeable samples. Significant departures from the norm, however, did occur for a few of the samples , and wide variations in borehole smoothness were evident between samples and with changes in mud density. (Eberle-NWWA)
W77-08667

8F. Concrete

CEMENT-MUD SPACER SYSTEM IMPROVES ILLINOIS WELLS,
Dow Chemical Co., Los Angeles, Calif. Dowell Div.
W. L. Crow, T. J. Griffin, and A. W. Putney.
Drilling-DCW, Vol. 38, No. 5, p 33-34, March, 1977. 2 fig.

Descriptors: *Drilling fluids, *Rotary drilling, *Cements, Well casings, Wells, *Illinois.
Identifiers: *Cement-mud spacers, Zone isolation.

The use of new water-base cement-mud spacer system between drilling mud and cement has proved effective in isolating production zones and obtaining better cement bonding. Designed to prevent intermixing of drilling fluid and cement during cementing operations, the spacer system helps eliminate channels or layers of drilling fluid occurring between the formation and cement, as well as reducing the chance of cement loss to naturally fractured or easily fractured formations. The spacer comes sacked and ready to mix in the field or cement bulk plant. A variety of materials can be used for weighting the spacer from 9.0 ppg up to 20 ppg as needed, or for combating lost circulation. Dramatic zone-isolation results have been obtained when the spacer was applied in more than 100 oil and gas wells in the lower Illinois basin. (Eberle-NWWA)
W77-08647

SPECIALTY CEMENTS CAN SOLVE SPECIAL PROBLEMS,
Western Co., Houston, Tex.
P. N. Parker.
Oil and Gas Journal, Vol. 75, No. 9, p 128-131, February 28, 1977. 4 tab.

Descriptors: *Cements, *Slurries, *Drilling, Pozzolans, Well casings, Cement grouting, Additives, Oil wells.
Identifiers: Thixotropic cements, Calcium aluminate cements.

Specialty cements are formulated by service companies and manufacturers for highly specific drilling needs. Pozzolan cements (blends of cement and fly ash) are of light to moderate density and can be modified for use at all depths. Easy to use and economical, pozzolan slurries are used for casing jobs, and sometimes for squeezes and lost-circulation plugs. Thixotropic cements are valuable for their gel-forming properties, and are employed primarily for cementing in lost-circulation zones. Special retarders and fluid-loss-control additives must be used instead of conventional additives with such cements in order to preserve thixotropic properties. Quick-setting cements can be used to seal off severe lost-circulation zones where other slurries would be absorbed, while expanding cements can be used to improve bonding to casing and formation during primary cementing. Calcium aluminate cement is useful in both cold-weather and geothermal conditions. Various light weight and petroleum-based cements have specific applications to the oil and gas industry. (Eberle-NWWA)
W77-08664

ADDITIVES TAILOR CEMENT TO INDIVIDUAL WELLS,
Western Co., Houston, Tex.
P. N. Parker, and C. Clement.
Oil and Gas Journal, Vol. 75, No. 11, p 54-58, March 14, 1977. 1 tab

Descriptors: *Cements, *Slurries, *Additives, Cement grouting, Drilling, Well casings, Bentonite, Calcium chloride, Sodium chloride, Sands.
Identifiers: Accelerators, Retarders, Density adjustment materials, Fluid loss additives, Lost-circulation additives.

The major classifications of the additives used to change the properties of well cements are: (1) accelerators (2) retarders (3) density adjusters (4) dispersants (5) fluid-loss additives (6) lost-circulation materials (7) auxiliary additives. Accelerators are used in situations where waiting-on-cement time must be minimized, calcium chloride being the most common additive for this purpose. Retarders perform the opposite function in cases where increased well temperature results in rapid setting. Density adjusters and dispersants modify slurry handling properties as required by the specific drilling situation. Fluid loss and auxiliary additives improve bonding and cement strength (and may help prevent formation damage), while lost-circulation materials cover vugs and fractures or seal permeable zones into which unmodified cement would tend to penetrate. (Eberle-NWWA)
W77-08665

POLYMERIZATION OF CONCRETE FIGHTS CAVITATION,
Restruction Corp., Denver, Colo.
M. A. Murray, and V. F. Schultheis.
Civil Engineering-American Society of Civil Engineers, Vol 47, No 4, p 67-70, April 1977. 9 fig.

Descriptors: *Dams, *Concrete, *Polymers, *Idaho, Cavitation, Erosion, Flumes, Hydraulic structures, Repairing, Waterproofing, Plastics, Dam construction, Concrete dams, Settling basins, Construction.
Identifiers: *Dworshak Dam(Idaho), Polymerization.

The techniques and materials used for the repair of concrete are many and varied. The repair at Dworshak Dam utilized epoxy resins, dry pack mortar, fibrous concrete, and a new technique, polymerization, for significantly increasing the strength of concrete at the surface. This paper identified the procedure utilized for the polymerization of vertical concrete surfaces in the outlet structure and horizontal concrete surfaces in the stilling basin. (Sims-ISWS)
W77-09044

8G. Materials

DEVELOPMENT OF A LOW COST ASPHALT-RUBBER MEMBRANE FOR WATER HARVESTING CATCHMENTS AND RESERVOIR SEEPAGE CONTROL,
Arizona Water Resources Research Center, Tucson.
For primary bibliographic entry see Field 3B.
W77-08601

FINE SCREENING OF RAW SEWAGE,
A. McVie.
The Public Health Engineer, Vol. 5, No. 2, p 38-42, March, 1977. 4 fig, 5 tab, 9 ref.

Descriptors: *Fine aggregates, *Screens, Analysis, *Testing, Filtration, Equipment, Sewage treatment, Water quality standards, Solid wastes, Sludge treatment, Design criteria, On-site testing, Hydraulics, Waste water treatment.
Identifiers: *Fine screening(Strainers).

Fine screens, or strainers, were defined as those having multiple individual openings less than 10 millimeters in either face dimension. Bar screens in any form are not covered by this definition. Tests were conducted when fine mesh rotating cup screens failed to meet their hydraulic specifications because of mesh blinding. It was possible to define the strainer's effective open area by using the fabric geometry and Boucher's Law to compute the effective hydraulic capacity. Water temperature played a significant role in the calculation. For each perforation size, there is a head which cannot be exceeded without incurring malfunction and felting. This depends upon the sewage filterability index and the breakthrough point. Because sewage is expected to have a fairly constant general range for the filterability index, and thus consistent straining characteristics, strainer rotation speed should be varied for extreme cases. It was impossible to test for the filterability index with sewage under laboratory conditions. The results of this investigation led to an increased screen capacity of 250% and the cessation of felting. The general approach used here may be applied all types of fabric including fixed bar screens. However, the Boucher hydraulic solution is limited to conditions of streamline or near streamline flow. (Collins-FIRL)
W77-08629

DRILL STRING MAKEUP, PAST, PRESENT, FUTURE,
For primary bibliographic entry see Field 8C.
W77-08648

RECENT ADVANCES IN ROTARY DRILL BITS,
Smith International, Inc., Irvine, Calif. Smith Tool Div.
L. L. Garner, and D. J. Millar.
World Oil, Vol. 184, No. 4, p 52-56, March, 1977. 12 fig.

Descriptors: *Rotary drilling, *Drilling equipment, Oil industry, Offshore platforms.
Identifiers: *Roller cone bits, Bits(Drilling), Bearings, Lubrication.

Increased drilling costs have created greater interest in the economics afforded by longer bit life and faster penetration rates. Advances in journal bearing technology and improved soft formation bits are helping achieve both objectives. Analysis of bearing failures has been the focus of bearing research in recent years. Greater sealing integrity is now possible in bits designed with a minimum number of sealing points, while cone and ball hole cracking are being controlled by better welding and heat treating techniques. Considerations such as bearing length versus hole wall clearance, bearing surface finish, supplemental lubrication, and bit weight and speed parameters are vital areas of future bearing research. Tungsten carbide insert technology has resulted in the evolution of new soft formation bit designed from the original 3-cone insert bit. Extended jet nozzles permit 25 to 50 percent faster penetration through soft formations in holes larger than 9 5/8 inches in diameter. The 2-cone bit, now being used experimentally, allows larger cutter and bearing diameters in proportion to length, as well as increased flexibility for positioning jet nozzles. In addition, improved roller cone core bits and re-entry bits are currently being developed for the oil and gas industries. (Eberle-NWWA)
W77-08649

DIAMOND COMPOSITES USED IN NEW BITS.
Oil and Gas Journal, Vol 75, No 16, p 71-72, April 18, 1977. 2 tab.

Descriptors: *Drilling equipment, Rotary drilling.
Identifiers: *Drill bits, *Polycrystalline diamond, General Electric Stratapax Blanks, Tungsten carbide materials.

Drill bits with inserts made of polycrystalline diamond layers bonded to tungsten carbide have had recently shown success in laboratory and field

tests. The polycrystalline product, manufactured by General Electric's Specialty Materials Department, chips off in minute discrete fragments during drilling, always leaving a fresh cutting edge forward. Lab test results suggest that slug-type bits made with the new material perform best at speeds above 150 rpm on a downhole motor at bit weights between 12,000 and 21,000 lbs. Although four experimental bits failed in field tests due to splashback erosion and consequent nozzle loss, cutting edges were not worn and penetration rates during drilling were much higher than for roller-cone bits in comparable situations. General Electric recommends the new bit for drilling soft to medium-hard formations. (Eberle-NWWA)
W77-08651

WATER TURBINE PUMP FAILURE,
Union Carbide Corp., Oak Ridge, Tenn. Nuclear Div.
C. R. Schmitt, and F. J. Lambert, Jr.
Materials Performance, Vol 14, No 2, p 29-30, February, 1975. 1 fig, 1 tab, 1 ref.

Descriptors: *Pumps, *Non-destructive tests, Pumping, *Testing, Testing procedures.
Identifiers: *Pump failure, *Deep-well turbine pumps, Gray cast iron, Pump discharge heads.

Recently, the 14 inch diameter cast iron elbow section of the discharge head of a 5500 gpm deep-well turbine pump ruptured at an Oak Ridge, Tennessee, pumping station. Since this was the second such incident in four years time, the matter was taken under study (a third, similar cast iron discharge head rupture occurred shortly after this study was completed). Various non-destructive tests were performed on fragments of the pump casing. Tensile strength results were well below the ASTM specification values for that grade of gray cast iron when newly manufactured. Internal casing cracks were discovered not only in the ruptured discharge head but also in the replacement pump housing sent by the manufacturer. It was recommended to the manufacturer that replacement pump discharge heads in the future because from modular ductile iron or fabricated out of steel plate rather than gray cast iron, in order to better withstand pump vibration and water-hammer stresses. (Eberle-NWWA)
W77-08656

PUMPING TESTS PROVIDE USEFUL DATA,
Universal Oil Products, St. Paul, Minn. Johnson Div.
T. L. Johnson.
Johnson Driller's Journal, Vol 49, No 2, p 4-7, March-April, 1977. 3 fig.

Descriptors: *Pumping, *Aquifer characteristics, *On-site tests, Water table, Electronic equipment, Drawdown, Specified yield, Transmissivity, Storage coefficient.
Identifiers: Orifice weirs, *Pumping test data.

Properly done, a pumping test can provide data by which are calculated the maximum yield of a well, its efficiency potential, interference between wells, and many other properties of wells and aquifers. Accurate measurement of drawdown and strict control of pumping rate are essential in obtaining such data. When testing with an orifice weir, it is good practice to employ a pump which can provide the desired pumping rate at 1/2 to 3/4 its maximum capacity. Similarly, the gate valve on the orifice meter should be between 1/2 to 3/4 open to provide enough back pressure for stable, accurate readings. Test equipment must be set up and checked well in advance of the actual test to ensure that the water level completely recovers. If neighboring wells cannot be shut off for the duration of the tests, they should at least be pumped at a constant rate. To establish the pumping rate for a long-term test, specific capacity of the well should be noted and a pumping rate which uses about 3/4 of the available drawdown should be calculated from that. (Eberle-NWWA)
W77-08658

MULTI-SHOT CAMERA SYSTEM FOR BOREHOLE SURVEYING.
CIM Bulletin, Vol. 69, p 141, June, 1976. 1 fig.

Descriptors: *Borehole cameras, *Logging(Recording), Instrumentation, Photography, Boreholes, Monitoring.

A completely new, self-contained, 1 1/4 inch multi-shot camera unit for borehole surveying, which allows a choice of 0-12 degree, 0-34 degree, or 0-90 degree angle units and features a removable cassette film holder has been made available by Humphrey, Inc. 9212 Balboa Ave., San Diego, CA 92123. This new PH04 Series camera uses interchangeable gyros or magnetic compass directional units. It is furnished with a J-lock or standard thread connection to make it compatible with most systems now used in the field. (Eberle-NWWA)
W77-08668

SELF-PRESSURIZING SEALS KEEP SUBMERSIBLE MOTORS DRY,
General Electric Co., Schenectady, N.Y.
For primary bibliographic entry see Field 8C.
W77-08672

PUMP CONSTRUCTION MATERIALS,
Vanton Pump and Equipment Co., Union, N.J.
E. Margus.
Plant Engineering, Vol 123, No 11, p 123-126, June 10, 1976. 4 fig.

Descriptors: *Pumps, *Materials engineering, Hydraulic design, Iron, Steel, Stainless steel, Copper, Copper alloys, Plastics.
Identifiers: Cast iron, Carbon steel, Alloy steel, Nickel, Thermoplastics, Nonferrous metals.

Because a pump's ability to function in a given environment necessitates certain strength and resistance properties peculiar to that situation, pump construction materials must be chosen with care. Both metals and nonmetals are commonly used. The ferrous metals employed in pump manufacture include cast iron (for housings), carbon steel, allow steel, stainless steel, and special alloys. Nonferrous metals include aluminum, copper, magnesium, nickel, titanium, and various precious and semi-precious metals. Plastics are gaining wider and wider popularity for pump parts. PVC is being used in impellers, casings, and covers. Polyamides (nylons) are used for a wide range of mechanical parts, while pump gaskets, seals and packing are often made of Teflon. Their high resistivities to corrosives make plastics increasingly attractive for harsh environments. (Eberle-NWWA)
W77-08675

TESTS OF OIL RECOVERY DEVICES IN BROKEN ICE FIELDS. PHASE I,
ARCTEC, Inc., Columbia, Md.
For primary bibliographic entry see Field 5G.
W77-08915

POLYMERIZATION OF CONCRETE FIGHTS CAVITATION,
Restruction Corp., Denver, Colo.
For primary bibliographic entry see Field 8F.
W77-09044

8I. Fisheries Engineering

EXPANSION OF THE RANGE OF SOME FISH SPECIES IN CONNECTION WITH HYDRAULIC ENGINEERING CONSTRUCTION ON THE VOLGA AND ACCLIMATIZATION WORKS, (IN RUSSIAN),
E. P. Tsyplakov.
Vopr Ikhtiol. 14(3), p 396-405, 1974.

Descriptors: *Fish, *Ecological distribution, *Nichesm, *Hydraulic engineering, Hydraulic structures, Eels.
Identifiers: Black Sea pipefish, Caspian round goby, Black Sea pugolovka, Caspian kilka, Streamflow control, Stint, Lake white vendace, Peled, Taimen, Anguilla anguilla, Benthophilus stellatus, Clupeonella delicatula caspia m tsch, Coregonus peled, Coregonus sardinella vessicus, Hucho taimen, Neogobius melanostomus affinis, Osmerus eperlanus eperlanus m spirin, Fish species range, Syngnathus nigrolineatus, USSR, Volga.

Streamflow control of the Volga (USSR) has created favorable conditions for the expansion of the ranges of a number of fish species. Some of them, the stint (Osmerus eperlanus eperlanus m. spirinchus), Lake White vendace (Coregonus sardinella vessicus), peled (Coregonus peled), eel (Anguilla anguilla) and taimen (Hucho taimen) are northern immigrants and others, the Caspian kilka (Clupeonella delicatula caspia morpha tscharchalensis), Black Sea pipefish (Syngnathus nigrolineatus), Caspian round goby (Neogobius melanostomus affinis and Black Sea pugolovka (Benthophilus stellatus) are southern immigrants. Free ecological niches have been created which are rapidly being occupied by new sometimes economically worhtless species.--Copyright 1975, Biological Abstracts, Inc.
W77-08715

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 991, Price codes: A04 in paper copy, A01 in microfiche. UNC-WRRI Report No 3 (Revised), Jan 1976. 57 p. OWRT A-999-NC(45). 14-31-0001-5033.

Descriptors: *North Carolina, *Research priorities, Surveys, *University, *Colleges, Education, Training, *Water resources, *Research and development.
Identifiers: *Research interests.

An inventory was assembled of water-related research interests in the following North Carolina colleges and universities: North Carolina State University at Raleigh, University of North Carolina at Asheville, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, University of North Carolina at Greensboro, University of North Carolina at Wilmington, Appalachian State University, East Carolina University, NC Agricultural and Technical State University, NC Central University, Western Carolina University, Campbell College, Duke University, Guilford College, Livingstone College, Mars Hill College, St. Andrews Presbyterian College, and Warren Wilson College. (Howells-NC State)
W77-08931

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-268 977, Price codes: A07 in paper copy, A01 in microfiche. UNC-WRRI Report No 4 (Revised), Jan 1976. 119 p. OWRT A-999-NC(46). 14-31-0001-5033.

Descriptors: *North Carolina, *Projects, *Research and development, Surveys, Contracts, Grants, Programs, Universities, Colleges, Water resources.

This report summarizes all water-related studies and research currently underway in North Carolina. It includes federal and state agencies, private industry, and all of the State's senior colleges and universities. project summaries include organization, investigator (for universities), descriptions, sponsoring agencies, and starting and estimated completion dates. (Howells-NC State)
W77-08938

9D. Grants, Contracts, and Research Act Allotments

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 09A.
W77-08931

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 09A.
W77-08938

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

WATER-RESOURCES INVESTIGATIONS IN KENTUCKY, 1976.
Geological Survey, Louisville, Ky. Water Resources Div.
For primary bibliographic entry see Field 07C.
W77-09078

WATER-RESOURCES INVESTIGATIONS IN WISCONSIN, 1976.
Geological Survey, Madison, Wis. Water Resources Div.
For primary bibliographic entry see Field 07C.
W77-09079

SUBJECT INDEX

1972 OCEAN DUMPING CONVENTION
International Law and Radioactive Pollution by Ocean Dumping: 'With All Their Genius and With All Their Skill...'
W77-08957 5G

ABSORPTION
Fate of Labeled n-Alkanes in the Blue Crab and Stripped Mullet,
W77-08764 5C

Toxicity, Accumulation, and Release of Three Polychlorinated Naphthalenes (Halowax 1000, 1013, and 1099) in Postlarval and Adult Grass Shrimp, Palaemonetes Pugio,
W77-08773 5C

Study on the Post-Mortem Identification of Pollutants in the Fish Killed by Water Pollution: Detection of Arsenic,
W77-08775 5A

The Accumulation of Polybominated Biphenyls by Fish,
W77-08777 5C

Studies on Mercury Content in Selected Fish Species from Pomeranian Gulf and Szczecin Firth (Badania nad Zawartoscia Rteci Ogolnej W Wybranych Gatunkach Ryb Zatoki Pomorskiej I),
W77-08781 5C

Polychlorinated Biphenyls in Adult Mayflies (Hexagenia bilineata) from the Upper Mississippi River,
W77-08783 5C

Concentrations of PCBs, Dieldrin and DDT Residues in Marine Animals from Liverpool Bay,
W77-08788 5C

Algal Uptake of Copper from Compounds and Its Effect on Salt Metabolism in Algae,
W77-08792 5C

Production and Heavy Metal Concentration of Vascular Aquatic Macrophytes in Three Eastern Connectituct Rivers,
W77-08814 5B

ACCABONAC HARBOR (NY)
Effects of Mercury, Cadmium, and Lead Salts on Regeneration and Ecdysis in the Fiddler Crab, UCA Pugilator,
W77-08702 5C

ACCESS ROUTES
Recreational Water Resources Problems.
W77-08711 6B

ACCLIMATION
Laboratory Methods for Determining Temperature Preference,
W77-08770 5C

ACID-BASE EQUILIBRIUM
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ACID MINE WATER
Acid Mine Drainage (AMD) and its Impact on a Small Virginia Stream,
W77-08784 5C

ACID WASTES
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

ACIDIC WATER
Method for Determining Acute Toxicity of an Acid Waste and Limiting Permissible Concentration at Boundaries of an Oceanic Mixing Zone,
W77-08771 5C

Atmospheric Sulfate Additions and Cation Leaching in a Douglas Fir Ecosystem,
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